

# START

0020800

1 of 8

Mr. John Grantham  
State of Washington  
Department of Ecology  
Nuclear & Mixed Waste Program  
P. O. Box 47600  
Olympia, WA 98504-7600

FLUOR DANIEL, INC.

Date: NOVEMBER 17, 1992

Reference: Hanford Waste Vitrification Plant  
DOE Contract DE-AC06-86RL10838  
Fluor Contract 8457

Transmittal No.: WDOE-260

Dear Mr. Grantham:

## TRANSMITTAL

We enclose \*  copy of the items listed below. These are issued per US-DOE request.  
\*2 FULLSIZE BLUELINES ROLLED & 2 SPECIFICATIONS, & 1 REDUCED

Response due to Fluor: N/A  
Responds to: B210A PACKAGE

NUMBER	Rev.	Date	TITLE
SEE TRANSMITTAL ATTACHMENT	-----	11/17/92	B210A PACKAGE VITRIFICATION BUILDING FOUNDATION
			TBD/HOLD RECORD NO. HWVP-FD-211, CONTROLLED THRU THE PROJECT CONFIGURATION MGMT GROUP, DEFINES ALL KNOWN POTENTIAL CHANGES PENDING FOR THE B-210A PACKAGE. SEE ATTACHMENT FOR OPEN DESIGN ISSUES LISTING FOR HWVP-FD-211.

### Distribution:

REFERENCE: FRP-643, FUP-288  
R. L. Long: DOE-RL w/0  
VPO/AME Corresp Cntrl Cntr, MSIN A5-10  
(B210A PACKAGE), w/0  
P. Felise, WHC-RL (MSIN G6-16), w/1F, 1 SPEC  
Environmental Data Management Center  
(MSIN H4-44), w/1F, 1 SPEC  
D. Duncan, US EPA, Region X w/0

Very truly yours,

*Rosalia Cadenas for*  
R. S. Poulter  
Project Director

BWK

RSP:BWK:lh



(PART OF HWVP-FD-211)  
SHT 2

Vit Building Structure  
Open Design Issues Tracking Log

1. Incorporate into the design the modifications resulting from the Corrosion Evaluation Materials Workshops to meet 40 year life for non-replaceable components. Preliminary findings resulted in some line material changes and sumps material changes. Effects Phase I & II.
2. Spare Embeds and Spare Lines approved in Change Request HWVP-0728 Rev 1 have not been completely incorporated. Effects Phase I & II.
3. Electrical ground loop material change - CR-690, pending approval will change material from carbon steel to copper. Effects Phase I & II.
4. Piping and ductwork added to B210A package, from B240/B250 packages, at the CPC/CMR Exit Tunnel (to suit constructability requirements) - pending CR-719 approval. Effects Phase I & II.
5. Additional sump evacuation line agreed to for evacuation of secondary containment area, of the double lined (in-cell) sumps, in the event of primary liner failure to meet 24 hour requirement has not been incorporated into the design. Effects Phase I & II.
6. Increase all embedded pipes to a 2" minimum size impactive change to detailed design, resulting in modified layouts, increased wall congestion; rework to increase all smaller embedded lines to 2" in progress. Effects Phase I & II.
7. Embed modifications at shield doors, to suit current shield modeling requirements not incorporated in design. Effects Phase II.
8. Feed Receipt lines not incorporated into design. Effects Phase I & II.
9. Mog Reconfiguration and HEMF not incorporated in design. Effects Phase II.
10. Hydrogen Mitigation not in design. Effects Phase II.
11. The design to prevent flooding of the Zone 1 Exhaust tunnel and potential choking of the air path way has not been incorporated in the design. The current design allows for the draining into the Smear Test Exit Tunnel will impose additional operational safety requirements. Effects Phase I & II.
12. Canister decon cell/Canister Storage Pit ventilation modifications is a concern with cross contamination issues. The current design with the ducts from the exhaust tunnel provide a path for contamination of the Smear Test Exit Tunnel and the Canister Storage Pit which would create significant operational difficulties in obtaining a clean canister smear at the Smear Test Station. Effects Phase I.

13. Coverblocks hitting walls with the current design providing only 1" clearance between the ends of the coverblocks and the east/west Canyon walls. Routine removal, movement and reinstallation of the coverblocks may cause damage to the walls and shake the entire building. DWPF lessons learned item. Effects Phase I & II.
14. Relocation/modification to the HVAC Exhaust Tunnel sump has not been incorporated. The current design has not provided a safe means to access and maintain the Zone 1 exhaust tunnel sump. Effects Phase I.
15. Access to SS Zone I Exhaust plenum has not been provided. Intent of TDP is to require access for inspection. WHC will change TDP to clarify. Effects Phase II.
16. Results of Solid Waste Study have not been implemented as study is on going. Resolutions to meet requirements for handling, shipping and disposal of radioactive solid waste remains open. Effects Phase I & II.
17. The need for a double contained sump in the Exhaust Tunnel is unresolved. Need to determine if a double sump lining in these areas is a RCRA and DOE order 5820.2A requirement. Effects Phase I.
18. Completed HVAC Zone I design in the B210A reflects incomplete/unapproved design philosophy, which has been integrally detailed with building structure (e.g. exhaust tunnel). Effects Phase I & II.
19. Add exterior doors to Vit. Bldg, to suit reconfiguration activities in the MRB; changes in review, potential change to B210A slab and walls not incorporated in design. Effects Phase I & II.
20. Hatch between canister decon cell and ST/ET not complete. Modifications potentially required to facilitate ST/EG crane removal; opening size changes complicated by conflicting requirements; shielding requires closed area, and crane requires open area for crane removal; current design requires potential modification impacts currently unknown. Effects Phase II.
21. Embed changes resulting from Standby Power Changes could cause design modifications. Effects Phase II.
22. GEP/Rebar Wall Congestion Constructability Concern not resolved. Plastic model in development to assist visualization.
23. Slopes need to be added to Exhaust Tunnel floors down stream of the sump and flat floor with tolerance for the upstream, to assure a positive drain path to the sumps. Effects Phase I.
24. Modifications to voids - e.g., 1 or 2 inspection parts access sealer hardener, is not resolved. Hanford Plant "Lessons Learned" item. Effects Phase I & II.
25. Hydrogen Explosion Analysis - impacts, if any, currently unknown.

26. Catch tank corridor is not access Zone II in current design. WHC to provide letter of direction for change. Effects Phase II.
27. MSM Handling - impacts, if any, currently unknown. Effects Phase I & II.
28. Laydown Space/Canyon functionality study to provide adequate jumper and equipment laydown space not completed. Effects Phase I & II.
29. CCTV locations under review - may result in new embeds (e.g. RR Well) or modified embeds. Effects Phase I & II.
30. Design of the seal between concrete in the exhaust tunnel and the sump to prevent leakage has not been incorporated in design. Effects Phase I.
31. Deletion of Health Protection Air Sample Taps (embeds) for process cell not implemented pending approval of Change Request HWVP-0862. CR will delete requirement from TDP, Section 11, Item 160. Effects Phase II.

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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
05	B210A	H-2-117074	1	0	11/12/92	(S)CIVIL VIT BUILDING GEN NOTES AND OVERALL SITE PLAN
05	B210A	H-2-117075	1	0	11/12/92	(S)CIVIL VIT BUILDING GRADING & DRAINAGE PLAN
05	B210A	H-2-117076	1	0	11/12/92	(S)CIVIL VIT BUILDING SECTIONS
20	B210A	H-2-117425	1	0	11/12/92	(S)STRUCTURAL VITRIFICATION BUILDING GENERAL NOTES
20	B210A	H-2-117425	2	0	11/12/92	(S)STRUCT VIT BLDG ABBREVIATIONS AND LEGEND
20	B210A	H-2-117425	3	0	11/12/92	(S)STRUCT VIT BLDG ANCHOR BOLT & SLEEVE TYPICAL DETAILS
20	B210A	H-2-117425	4	0	11/12/92	(S)STRUCT VIT BLDG CONC REINF TYPICAL DETAILS
20	B210A	H-2-117425	5	0	11/12/92	(S)STRUCT VIT BLDG TYP WALL & SLAB DETS SINGLE LAYER WALL REINF
20	B210A	H-2-117425	6	0	11/12/92	(S)STRUCT VIT BLDG TYP WALL & SLAB DETS DOUBLE LAYER WALL REINF
20	B210A	H-2-117425	7	0	11/12/92	(S)STRUCT VIT BLDG TYPICAL CONSTR JOINTS FOR MAT, SLAB & WALLS
20	B210A	H-2-117425	8	0	11/12/92	(S)STRUCT VIT BLDG EMBEDDED ITEMS AND MISC DETAILS
20	B210A	H-2-117426	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL CONFIG PLAN & DWG INDEX
20	B210A	H-2-117427	1	0	11/12/92	(S)STRUCT VIT BLDG CONFIGURATION SECTIONS A & B
20	B210A	H-2-117428	1	0	11/12/92	(S)STRUCT VIT BLDG CONFIGURATION SECTIONS C & D
20	B210A	H-2-117429	1	0	11/12/92	(S)STRUCT VIT BLDG CONFIGURATION SECTIONS E, F, G & H
20	B210A	H-2-117431	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL FORMING PLAN SOUTH END
20	B210A	H-2-117432	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL FORMING PLAN NORTH END
20	B210A	H-2-117435	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL MAT REINF PLAN SOUTH END BOT REINF
20	B210A	H-2-117436	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL MAT REINF PLAN NORTH END BOT REINF
20	B210A	H-2-117437	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL MAT REINF PLAN SOUTH END TOP REINF
20	B210A	H-2-117438	1	0	11/12/92	(S)STRUCT VIT BLDG TUNNEL MAT REINF PLAN NORTH END TOP REINF
20	B210A	H-2-117439	1	0	11/12/92	(S)STRUCT VIT BLDG TRANSVERSE TUNNEL MAT REINF PLAN
20	B210A	H-2-117441	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117442	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117443	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117444	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117445	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117446	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117447	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117448	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117449	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
20	B210A	H-2-117450	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117451	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117452	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117453	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117454	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117455	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117456	1	0	11/12/92	(S)STRUCTURAL VIT BLDG TUNNEL FLOOR PLAN
20	B210A	H-2-117458	1	0	11/12/92	(S)( )STRUCT VIT BLDG TUNNEL & FIRST FLR EQUIP FDN SCHEDULE
20	B210A	H-2-117460	1	H	11/12/92	(*)( )STRUCT VIT BLDG FIRST FLOOR CONFIG PLAN & DWG INDEX
20	B210A	H-2-117461	1	E	11/12/92	(*)( )STRUCT VIT BLDG FIRST FLOOR FORMING PLAN SOUTH END
20	B210A	H-2-117462	1	E	11/12/92	(*)( )STRUCT VIT BLDG FIRST FLOOR FORMING PLAN NORTH END
20	B210A	H-2-117465	1	E	11/12/92	(*)( )STRUCT VIT BLDG FIRST FLOOR REINF PLAN SOUTH END
20	B210A	H-2-117466	1	E	11/12/92	(*)( )STRUCT VIT BLDG FIRST FLR REINF PLAN NORTH END
20	B210A	H-2-117468	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTION R
20	B210A	H-2-117469	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTIONS S & T
20	B210A	H-2-117470	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTIONS U & V
20	B210A	H-2-117471	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTION W & X
20	B210A	H-2-117472	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTIONS AN, AP, & AQ
20	B210A	H-2-117473	1	0	11/12/92	(S)( )STRUCT VIT BLDG REINFORCING SECTIONS AR, EV & FE
20	B210A	H-2-117474	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117475	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117476	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117477	1	F	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117478	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117479	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117480	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117481	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117482	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117483	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117484	1	E	11/12/92	(*)( )STRUCTURAL VIT BLDG FIRST FLOOR PLAN
20	B210A	H-2-117485	1	D	11/12/92	(*)( )STRUCT VIT BLDG ROOMS 0013 & 0086 CEILING PLAN

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
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20	B210A	H-2-117485	2	D	11/12/92	(*) ( ) STRUCT VIT BLDG ROOMS 0008 & 0012 CEILING PLANS
20	B210A	H-2-117939	1	O	11/12/92	(S) STRUCT VIT BLDG WALL LOCATION PLAN TUNNEL
20	B210A	H-2-117939	2	C	11/12/92	( ) STRUCT VIT BLDG WALL LOCATION PLAN FIRST FLOOR
20	B210A	H-2-117940	1	O	11/12/92	(S) STRUCTURAL VIT BLDG WALL 0047W1 ELEVATIONS
20	B210A	H-2-117941	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117942	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117943	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117944	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117945	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117946	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117947	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117948	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117949	1	O	11/12/92	(S) STRUCTURAL VIT BLDG WALL 0048W1 ELEV
20	B210A	H-2-117950	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117951	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117952	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117953	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117954	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117955	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117956	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117957	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117958	1	O	11/12/92	(S) STRUCTURAL VIT BLDG WALL 0048W3 ELEVATIONS
20	B210A	H-2-117959	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117960	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117961	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117962	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117963	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117964	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117965	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117966	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117967	1	O	11/12/92	(S) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS

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20	B210A	H-2-117968	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117968	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117969	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117969	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117970	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117971	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117972	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117973	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117974	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117975	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117976	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117977	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117978	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117979	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117979	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117980	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117981	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117982	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117982	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117983	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117984	1	G	11/12/92	(*)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117984	2	D	11/12/92	(*)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117985	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117985	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117986	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117987	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117988	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117989	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117990	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117991	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117992	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS



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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
20	B210A	H-2-117993	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117994	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117995	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117996	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117997	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117998	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-117999	1	G	11/12/92	(*) ( ) STRUCTURAL VIT BLDG WALL ELEVATIONS
20	B210A	H-2-118226	1	0	11/12/92	(S)( ) STRUCT VIT BLDG REINF SECTS CA, CB, CC, CD, CE, & CF
20	B210A	H-2-118227	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG TUNNEL REINF SECTIONS
20	B210A	H-2-118228	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS AND DETAILS
20	B210A	H-2-118229	1	0	11/12/92	(S)( ) STRUCT VIT BLDG REINFORCING SECTIONS
20	B210A	H-2-118230	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118231	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118232	1	E	11/12/92	(*) ( ) STRUCTURAL VIT BLDG SECTION & DETAILS
20	B210A	H-2-118232	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118232	3	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118233	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118234	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118234	2	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118234	3	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118234	4	E	11/12/92	(*) ( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118235	1	0	11/12/92	(S) STRUCTURAL VIT BLDG SS SUMPS
20	B210A	H-2-118235	2	0	11/12/92	(S) STRUCTURAL VIT BLDG SS SUMPS
20	B210A	H-2-118235	3	0	11/12/92	(S) STRUCTURAL VIT BLDG SS SUMPS
20	B210A	H-2-118235	4	0	11/12/92	(S) STRUCTURAL VIT BLDG SS SUMPS
20	B210A	H-2-118235	5	0	11/12/92	(S) STRUCTURAL VIT BLDG SUMPS
20	B210A	H-2-118235	6	0	11/12/92	(S) STRUCTURAL VIT BLDG SUMPS
20	B210A	H-2-118236	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS AND DETAILS
20	B210A	H-2-118237	1	0	11/12/92	(S) STRUCTURAL VIT BLDG SECTIONS AND DETAILS
20	B210A	H-2-118238	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS AND DETAILS
20	B210A	H-2-118239	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG INSERT PLATE SCHEDULE

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
20	B210A	H-2-118240	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG INSERT PL SCHED & DETS
20	B210A	H-2-118240	2	0	11/12/92	(*) ( ) STRUCTURAL VIT BLDG INSERT PL DETAILS
20	B210A	H-2-118242	1	0	11/12/92	(*) ( ) STRUCTURAL VIT BLDG EMBED PL SCHED & DETS
20	B210A	H-2-118243	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS AND DETAIL
20	B210A	H-2-118244	1	0	11/12/92	(S)( ) STRUCT VIT BLDG PUMP FDS SCHED & DETAIL
20	B210A	H-2-118245	1	0	11/12/92	(S)( ) STRUCT VIT BLDG EQUIP PIERS SCHED & DETAILS
20	B210A	H-2-118246	1	E	11/12/92	(*) ( ) STRUCTURAL VIT BLDG SLEEVE SCHEDULE
20	B210A	H-2-118247	1	D	11/12/92	(*) ( ) STRUCTURAL VIT BLDG SLEEVE DETAILS
20	B210A	H-2-118248	1	D	11/12/92	(*) ( ) STRUCTURAL VITRIFICATION BUILDING CONCRETE HATCH DETAILS
20	B210A	H-2-118248	2	D	11/12/92	(*) ( ) STRUCTURAL VITRIFICATION BUILDING CONCRETE HATCH DETAILS
20	B210A	H-2-118248	3	D	11/12/92	(*) ( ) STRUCTURAL VITRIFICATION BUILDING CONCRETE HATCH DETAILS
20	B210A	H-2-118248	4	D	11/12/92	(*) ( ) STRUCTURAL VITRIFICATION BUILDING CONCRETE HATCH DETAILS
20	B210A	H-2-118248	5	D	11/12/92	(*) ( ) STRUCTURAL VITRIFICATION BUILDING CONCRETE HATCH DETAILS
20	B210A	H-2-118249	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG SECTIONS & DETAILS
20	B210A	H-2-118250	1	0	11/12/92	(S)( ) STRUCT VIT BLDG RAILROAD DOOR EMBEDS SECTIONS & DETAILS
20	B210A	H-2-118280	1	0	11/12/92	(S)( ) STRUCTURAL VIT BLDG LINER PLATE DETAILS
20	B210A	H-2-118281	1	D	11/12/92	(*) ( ) STRUCTURAL VIT BLDG LINER PLATE DETAILS
20	B210A	H-2-118283	1	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT FORMING PLAN
20	B210A	H-2-118283	2	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118283	3	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118283	4	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118283	5	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118283	6	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118283	7	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT PLAN
20	B210A	H-2-118284	1	D	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT SECTIONS & DETAILS
20	B210A	H-2-118284	2	D	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT SECTIONS & DETAILS
20	B210A	H-2-118284	3	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT SECTIONS & DETAILS
20	B210A	H-2-118284	4	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT SECTIONS & DETAILS
20	B210A	H-2-118284	5	C	11/12/92	(*) ( ) STRUCT VIT BLDG TUNNEL EXHAUST DUCT SECTIONS & DETAILS
20	B210A	H-2-118286	1	0	11/12/92	(S)( ) STRUCT VIT BLDG CATCH TANK AREA FLOOR LINER PL
20	B210A	H-2-118286	2	0	11/12/92	(S)( ) STRUCT VIT BLDG CATCH TANK AREA FLOOR LINER PL

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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
30	B210A	H-2-116005	1	0	11/12/92	(S)VIT BUILDING FOUNDATION TITLE SHEET
30	B210A	H-2-116006	1	0	11/12/92	(S)VIT BUILDING FOUNDATION DRAWING INDEX
30	B210A	H-2-116006	2	0	11/12/92	(S)VIT BUILDING FOUNDATION DRAWING INDEX
30	B210A	H-2-117523	1	D	11/12/92	(*)()ARCHITECTURAL/PLUMBING VITRIFICATION BLDG DRAINAGE EMBEDS
40	B210A	H-2-120002	1	C	11/10/92	(*)MECH VIT BLDG EMBEDDED TUBE MSM BAG TYPE ASSEMBLY
40	B210A	H-2-120037	1	C	11/10/92	(*)MECH VIT BLDG EMBEDDED TUBE PLUG DELIVERY SYSTEM ASSEMBLY
40	B210A	H-2-120037	2	C	11/10/92	(*)MECH VIT BLDG EMBEDDED TUBE PLUG DELIVERY SYSTEM SECT & VIEW
40	B210A	H-2-120060	1	0	11/10/92	(S)MECH VIT BLDG EMBEDDED PIPING SAMPLING RABBIT SYSTEM ASSY
40	B210A	H-2-120060	2	0	11/10/92	(S)MECH VIT BLDG EMBEDDED PIPING SAMPLING RABBIT SYSTEM DET
40	B210A	H-2-120061	1	C	11/10/92	(*)MECH VIT BLDG EMBEDDED TUBE SMEAR TEST EXIT TUNNEL ASSEMBLY
40	B210A	H-2-120073	1	C	11/10/92	(*)MECH VIT BLDG MC-ICC ELEC CONN INR CSTR CLOSURE ASSY
40	B210A	H-2-120073	2	C	11/10/92	(*)MECH VIT BLDG MC-ICC ELEC CONN INR CSTR CLOSURE EMBED FR
40	B210A	H-2-120073	3	C	11/10/92	(*)MECH VIT BLDG MC-ICC ELECT CONN INR CSTR CLOSURE SECT & DET
40	B210A	H-2-120073	4	C	11/10/92	(*)MECH VIT BLDG MC-ICC ELEC CONN INR CSTR CLOSURE ADJ FR
40	B210A	H-2-120141	1	C	11/10/92	(*)MECH VIT BLDG EMBED TUBE CRN RTRV SYS SMEAR TEST EXIT TNL
40	B210A	H-2-120241	1	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN ASSEMBLY
40	B210A	H-2-120241	2	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN SECT & DET
40	B210A	H-2-120241	3	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN EMBED FR
40	B210A	H-2-120241	4	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN SECT & DET
40	B210A	H-2-120241	5	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN ADJ FR
40	B210A	H-2-120244	1	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL HOT WTR PRCS CONN ASSY
40	B210A	H-2-120244	2	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL HOT WTR PRCS CONN SECT & DET
40	B210A	H-2-120244	3	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL HOT WTR PRCS CONN EMBED FR
40	B210A	H-2-120244	4	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL HOT WTR PRCS CONN ADJ FR
40	B210A	H-2-120245	1	C	11/10/92	(*)MECH VIT BLDG MC-ICC PRCS CONN INR CSTR CLOSURE ASSEMBLY
40	B210A	H-2-120245	2	C	11/10/92	(*)MECH VIT BLDG MC-ICC PRCS CONN INR CSTR CLOSURE SECT & DET
40	B210A	H-2-120245	3	C	11/10/92	(*)MECH VIT BLDG MC-ICC PRCS CONN INR CSTR CLOSURE EMBED FR
40	B210A	H-2-120245	4	C	11/10/92	(*)MECH VIT BLDG MC-ICC PRCS CONN INR CSTR CLOSURE ADJ FR
40	B210A	H-2-120247	1	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL SP HOT WATER CONN ASSY
40	B210A	H-2-120247	2	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL SP HOT WATER CONN SECT & DET
40	B210A	H-2-120247	3	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL SP HOT WATER CONN EMBED FR

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DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
40	B210A	H-2-120247	4	C	11/10/92	(*)MECH VIT BLDG MC-CDC TRANS TNL SP HOT WATER CONN ADJ FR
50	B210A	H-2-124090	1	0	11/10/92	(S) PIPING VIT BUILDING GENERAL NOTES, LEGEND AND SYMBOLOGY
50	B210A	H-2-124091	1	0	11/10/92	(S) PIPING VIT BUILDING STANDARD FABRICATION DETAILS
50	B210A	H-2-124092	1	0	11/10/92	(S) PIPING VIT BUILDING TUNNEL SLAB LEVEL DRAWING INDEX
50	B210A	H-2-124094	1	0	11/10/92	(S) PIPING PLAN VIT BUILDING AREA S-A-1 AND S-A-2
50	B210A	H-2-124095	1	0	11/10/92	(S) PIPING PLAN VIT BUILDING AREA S-B-1 THRU S-B-3
50	B210A	H-2-126175	1	0	11/10/92	(S) PE-2"-20C-159-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126175	2	0	11/10/92	(S) PE-2"-20C-159-A-NONE SHEET 02 PIPING ISOMETRIC
50	B210A	H-2-126176	1	0	11/10/92	(S) PE-1"-20C-147-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126177	1	0	11/10/92	(S) PE-1"-20C-148-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126178	1	0	11/10/92	(S) PE-1"-20C-152-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126179	1	0	11/10/92	(S) PE-1"-20C-153-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126180	1	0	11/10/92	(S) PE-1"-20C-151-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126181	1	0	11/10/92	(S) PE-1"-20C-141-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126182	1	0	11/10/92	(S) PE-1"-20C-142-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126183	1	0	11/10/92	(S) PE-1"-20C-143-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126184	1	0	11/10/92	(S) PE-1"-20C-144-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126185	1	0	11/10/92	(S) PE-1"-20C-149-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126186	1	0	11/10/92	(S) PE-1"-20C-146-A-NONE SHEET 01 PIPING ISOMETRIC
50	B210A	H-2-126187	2	0	11/10/92	(S) PE-6"-520-067-DD-NONE SHEET 02 PIPING ISOMETRIC
50	B210A	H-2-126187	3	0	11/10/92	(S) PE-6"-520-067-DD-NONE SHEET 03 PIPING ISOMETRIC
60	B210A	H-2-122380	1	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG DRAWING INDEX
60	B210A	H-2-122381	1	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG STANDARD DRAFTING SYMBOLS
60	B210A	H-2-122381	2	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG STANDARD ABBREVIATIONS AND GENERAL NOTES
60	B210A	H-2-122382	1	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG STANDARD ASSEMBLIES
60	B210A	H-2-122382	2	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG STANDARD DETAILS
60	B210A	H-2-122383	1	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG UNDERGROUND CONDUIT & GROUNDING PLAN
60	B210A	H-2-122383	2	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG UNDERGROUND CONDUIT & GROUNDING PLAN
60	B210A	H-2-122383	3	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG UNDERGROUND CONDUIT & GROUNDING PLAN
60	B210A	H-2-122383	4	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG UNDERGROUND CONDUIT & GROUNDING PLAN
60	B210A	H-2-122384	1	0	11/09/92	(S)( ) ELECTRICAL VIT BLDG UNDERGROUND & GROUNDING SECTIONS

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
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DISCIPLINE	PACKAGE	DRAWING NUMBER	SHEET NUMBER	REV	SIGNATURE DATE	DRAWING TITLE
60	B210A	H-2-122384	2	0	11/09/92	(S)( )ELECTRICAL VIT BLDG UNDERGROUND & GROUNDING SECTIONS
60	B210A	H-2-122384	3	0	11/09/92	(S)( )ELECTRICAL VIT BLDG UNDERGROUND & GROUNDING SECTIONS
60	B210A	H-2-122385	1	D	11/09/92	(*)ELECTRICAL VIT BLDG TUNNEL LEVEL SOUTH EMBED PLAN
60	B210A	H-2-122385	2	D	11/09/92	(*)ELECTRICAL VIT BLDG TUNNEL LEVEL NORTH EMBED PLAN
60	B210A	H-2-122386	1	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	2	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	3	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	4	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	5	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED DETAILS & ELEVATIONS
60	B210A	H-2-122386	6	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	7	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	8	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	9	D	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS
60	B210A	H-2-122386	10	C	11/09/92	(*)ELECTRICAL VIT BLDG WALL EMBED ELEVATIONS

TOTAL: 262

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,  
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CORDS TRANSMITTAL ATTACHMENT

DISCIPLINE	PKG	SPECIFICATION	PKG	PACKAGE TITLE	SECTION	SECTION	SECTION TITLE
		NUMBER	REV		NUMBER	REV	
		B210A	B-595-C-B210A 00	VITRIFICATION BUILDING FOUNDATION			
20		B210A			02220	0	(S)EXCAVATION AND BACKFILL
20		B210A			03200	0	(S)CONCRETE REINFORCEMENT
20		B210A			03252	0	(S)CONCRETE ANCHORS
20		B210A			03300	0	(S)CAST-IN-PLACE CONCRETE
20		B210A			05123	0	(S)MISCELLANEOUS METALS
30		B210A			03010	0	(S)METALLIC TOPPING
30		B210A			07160	0	(S)BITUMINOUS DAMPPROOFING
30		B210A			09875	0	(S)PRIMING OF STEEL
40		B210A			05059	0	(S)WELDING - STAINLESS STEEL LINERS
40		B210A			05062	0	(S)WELDING - PIPING
40		B210A			05560	0	(S)EMBEDDED WALL PENETRATIONS
40		B210A			13252	0	(S)PRECAUTIONS FOR FABRICATION, HANDLING AND STOR OF STAINLESS STEEL AND NICKEL ALLOYS
40		B210A			15196	0	(S)IDENTIFICATION AND TAGGING METHODS FOR MECHANICAL INSPECTION
50		B210A			RD-1	0	(S)RELATED DOCUMENT NO. 1
58		B210A			15060	0	(S)PIPING MATERIAL, FABRICATION, ERECTION & PRESSURE TESTING (ALLOY PIPING)
58		B210A			15062	0	(S)PIPING MAT'L, FAB, ERECTION & PRESS TESTING SPEC DOUBLE CONTAINED
58		B210A			15250	C	(*)MECHANICAL INSULATION
60		B210A			16100	0	(S)ELECTRICAL INSTALLATION
60		B210A			16110	0	(S)ELECTRICAL MATERIAL AND DEVICES
60		B210A			16111	D	(*)CONDUIT SCHEDULE
60		B210A			16905	D	(*)ELECTRICAL TESTING

TOTAL: 22

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION, 57/PIPING STRESS, 58/PIPING MATERIAL, 60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

VITRIFICATION BUILDING FOUNDATION





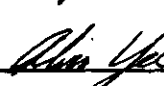
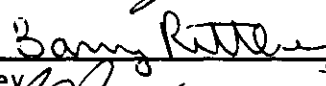
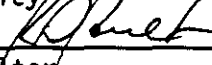
Specification B-595-C-B210A

"APPROVED FOR CONSTRUCTION"

Revision No. 0

Issue Date 11-12-92

APPROVED BY:

 R. W. King	Project Package Engineer	<u>11/12/92</u> Date
 D. M. Garrett	Area Project Manager	<u>11/12/92</u> Date
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 A. K. Yee	Independent Safety Manager	<u>11/12/92</u> Date
 J. G. Kelley	Quality Assurance Manager	<u>11/12/92</u> Date
 R. S. Poulsen	Project Director	<u>11/12/92</u> Date

NOV 16 1992

Vitrification Building Foundation  
(B-595-C-B210A)

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U.S. DEPARTMENT OF ENERGY  
Hanford Waste Vitrification Plant  
Richland, Washington  
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457

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\* Submitted as Reference Document

SECTION 02220  
EXCAVATION AND BACKFILL  
(B-595-C-B210A-02220)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA YES     NO X  
QUALITY LEVEL I     II X  
SAFETY CLASS 1     2     3     4 X

ORIGINATOR:

CHECKER:

M. S. Whitten 11/11/92  
M. S. Whitten, Structural Engineer Date

G. Kuilanoff 11/11/92  
G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/11/92  
Date

NOV 16 1992

SECTION 02220  
EXCAVATION AND BACKFILL

This addendum modifies the Project Standard Specification Section by addition, deletion, and/or revision for the purpose of conveying the package specific requirements of the HWVP project. The type of modification shall be defined, and indicated in subsequent text, as follows:

- (Addition) - Indicates the following statement(s) is/are added to the referenced text.
- (Deletion) - Indicates the following statement(s) is/are deleted from the referenced text.
- (Revisions) - Indicates the following statement(s) is/are revision(s) to the referenced text.

## PART 1 GENERAL

- |     |            |   |
|-----|------------|---|
| 1.1 | (Revision) | Revise entire paragraph to read, "This section covers the technical requirements for excavation, backfill and compaction of onsite materials and imported fill and rock surfacing for the installation of foundation mats, walls and underground utilities as shown on the Contract Drawings."  |
| 1.1 | (Addition) | Add a second paragraph to read, "The area of the Vitrification Building was mass excavated by the B200 contractor. As-built drawings of grades after the mass excavation are available from the Buyer as reference drawings. The Seller shall make necessary adjustments to the existing mass excavated area, by excavating, filling or placing lean concrete mud mats, to bring the grades to that required for the construction in this package." |
| 1.2 | (Deletion) | ASTM D2103<br>ASTM D4397 EA-84  |
| 1.3 | (Addition) | Specification Section 07160 Bituminous Dampproofing   |

## PART 2 PRODUCTS

- 2.1.2 (Deletion)
- 2.1.3 (Revision) Delete "Aggregate Base Course" from Table 1.

2.1.4 (Revision) Delete "2.1.2" from first line.

2.1.4.2 (Deletion)

2.1.6 (Deletion)

### PART 3 EXECUTION

3.1.1.2 (Revision) Revise entire paragraph to read, "Determine the lines, grades and elevations for the installation of foundation mats, walls and underground utilities as shown on the Contract Drawings."

3.1.2.5 (Revision) Revise entire paragraph to read, "Backfilling operations against concrete walls may not begin until the walls have reached their specified 28 day compressive strength as demonstrated by compression testing of molded concrete cylinders. In addition, assure that dampproofing has been completed in accordance with Specification Section 07160, Bituminous Dampproofing. Refer to Contract Drawings for any additional restrictions on backfilling operations against concrete walls."

3.1.2.7 (Revision) Delete "aggregate base course and" from first line.

3.2.1.2 (Revision) Revise paragraph title to "Excavation for Foundations".

3.2.1.3 (Deletion)

3.2.1.5 (Deletion)

3.2.2.2 (Revision) Revise paragraph title to "Backfilling for Foundations".

3.2.2.2.C (Deletion)

3.3.4.A (Revision) Delete "underground structures and slabs at grade" from first and second line.

3.3.4.B (Revision) Delete "Over and" and "underground structures and slabs at grade" from first and second line. Revised paragraph should begin "Adjacent to foundations; one test..."

3.3.4.D (Deletion)

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SECTION 02220  
EXCAVATION AND BACKFILL  
B-595-C-STD-02220

APPROVED FOR CONSTRUCTION

REVISION 0  
ISSUE DATE           

WAPA YES      NO X  
QUALITY LEVEL I      II X  
SAFETY CLASS 1      2      3      4 X

ORIGINATOR:

CHECKER:

M. S. Whitten 11/12/92  
M. S. Whitten, Structural Engineer Date

G. Kuilanoff 11/12/92  
G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/12/92  
Date

SECTION 02220  
EXCAVATION AND BACKFILL  
B-595-STD-02220

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SECTION 02220  
EXCAVATION AND BACKFILL

PART 1 GENERAL

1.1 SUMMARY

This section covers the technical requirements for excavation, backfill and compaction of onsite materials, imported fill, aggregate base course or rock surfacing for the installation of foundations, basement slab and walls, drilled foundations, slabs at grade, underground utilities and appurtenances as shown on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D75	1987 Standard Practice for Sampling Aggregates
ASTM D422	1963-E1 (R 1990) Standard Test Method for Particle-Size Analysis of Soils
ASTM D1140	1954-E1 (R 1990) Standard Test Method for Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
ASTM D1556	1990 Standard Test Method for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	1978 Standard Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound (4.54 kg) Rammer and 18 Inch (457 mm) Drop
ASTM D2103	1986 Standard Specification for Polyethylene Film and Sheeting
ASTM D2167	1984 (R 1990) Standard Test Method for Density and Unit Weight of Soil In-Place by the Rubber Balloon Method
ASTM D2774	1972 (R 1983) Standard Specification for Underground Installation of Thermoplastic Pressure Piping

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- ASTM D2922 1981 (R 1990) Standard Test Methods for  
Density of Soil and Soil-Aggregate in  
Place by Nuclear Methods (Shallow Depth)
- ASTM D4397 EA-84 1984 (R 1989) Standard Specification for  
Polyethylene Sheeting for Construction,  
Industrial, and Agricultural Applications
- ASTM D4718 1987 Standard Practice for Correction of  
Unit Weight and Water Content for Soils  
Containing Oversize Particles

FACTORY MUTUAL (FM)

- Data Sheet 3-10 March 1981 Installation and Maintenance of  
Private Fire Service Mains and Their  
Appurtenances

WASHINGTON ADMINISTRATIVE CODE (WAC)

- WAC 1990 Washington Administrative Code  
Chapter 296-155, Section 650-664.  
Excavation, Trenching and Shoring

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

- M41-10 1991 Standard Specifications for Road,  
Bridge, and Municipal Construction
- M46-01 1989 Materials Branch Laboratory Manual

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

- 1.4.1 "Organic material" when referenced shall include vegetation or  
trash which will deteriorate and promote undesirable settlement.
- 1.4.2 References to "free from organic material" shall mean less than  
5 percent by volume, with individual pieces less than 1/2 inch in  
maximum dimension.

1.5 SYSTEM DESCRIPTION

(Not Used)

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1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Documentation providing the backfill characterization, as specified in Paragraph 2.1.1.4 and 2.1.4 and the moisture density relationships specified in Paragraph 3.2.2.4.A, for each type of soil used for backfill.

1.6.2 Documentation of field density tests, as specified in Paragraph 3.3, including the location and depth of each sample tested.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Backfill Materials

2.1.1.1 Backfill materials shall be the originally excavated onsite material unless such material is determined to be unsuitable due to presence of organic material, excessive moisture, or other deleterious substances. Rocks which would be retained on a 3 inch (3") screen shall not be used in the fill material.

2.1.1.2 Imported sand used for backfill shall be a natural sand, graded from fine to coarse, not lumpy or frozen, with 100 percent passing a No. 4 sieve and 0 to 5 percent passing a No. 200 sieve. The sand shall be free from organic material, slag, cinders, ashes, and other refuse.

2.1.1.3 Imported fine gravel used for backfill shall be a natural gravel having particles with 100 percent passing a 3/4 inch sieve, 25 to 80 percent passing a 1/4 inch sieve and 0 to 5 percent passing a No. 200 sieve. The gravel shall be free from organic material, slag, cinders, ashes, and other refuse.

2.1.1.4 Imported fill materials utilized for backfill shall be properly characterized and verified utilizing grain-size distribution (ASTM D422 and D1140).

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- 2.1.1.5 Bedding materials shall conform to either the provisions of Paragraph 2.1.1.2 or 2.1.1.3 herein.
- 2.1.1.6 Notwithstanding the above requirements, gradation and particle size of imported granular fill material shall be controlled such that the laboratory and field testing required under Paragraphs 3.2.2.4.A and 3.3 herein can be performed in accordance with the specified ASTM or WSDOT test method.
- 2.1.2 Aggregate Base Course
- Aggregate base course shall conform to M41-10, Section 9-03.10, Aggregate for Gravel Base and the additional gradation requirements of Table 1 herein.
- 2.1.3 Rock Surfacing
- Material for the rock surfacing shall consist of crushed, processed or naturally occurring pit-run gravel. The material shall be free from organic material and shall conform to the gradation requirements provided in Table 1 herein and as approved by the Buyer.

TABLE 1

GRADATION REQUIREMENTS

SIEVE DESIGNATION	PERCENT PASSING BY WEIGHT	
	Aggregate Base Course	Rock Surfacing
1-1/2 inch square	100	100
3/4 inch square	50-85	-
1/4 inch square	35-65	50 max.
No. 4 mesh	25-45	-
No. 40 mesh	10-25	-
No. 200 mesh	0 to 10 max.	0 to 10 max.

- 2.1.4 For the material provided per Paragraph 2.1.2 and 2.1.3, one sample from the source material shall be taken in accordance with ASTM D75 prior to use.
- 2.1.4.1 The sample shall then be tested to demonstrate conformance to the specified requirements. Testing shall be performed in accordance with the procedures specified in M41-10, Section 9-03.20, Test Methods for Aggregates.

- 2.1.4.2 Test procedures in M41-10, Section 9-03.20 for aggregate base course, shall be WSDOT 102, WSDOT 104, WSDOT 111 and WSDOT 611 provided in M46-01.
- 2.1.4.3 Test procedures in M41-10, Section 9-03.20 for rock surfacing, shall be WSDOT 102, WSDOT 104, and WSDOT 111 provided in M46-01.
- 2.1.5 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 psi lengthwise and 150 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket provided with other means to protect it from corrosion. The tape shall be as specified in Table 2 below and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 2

TAPE COLOR

Yellow: Electric  
Red: Gas, Oil, Dangerous Materials  
Orange: Telephone, Telegraph, Security and Fire Communications  
Blue: Water Systems (raw, sanitary, and fire)  
Green: Sewer and Drainage Systems

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material.

- 2.1.6 Vapor Barriers (Water Vapor Retarders)

Polyethylene sheet for vapor barrier shall be 6 mil in thickness conforming to ASTM D2103 or ASTM D4397 EA-84.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

### PART 3 EXECUTION

#### 3.1 PREPARATION

##### 3.1.1 Prior to Excavation

3.1.1.1 Obtain permission to excavate from the Buyer.

3.1.1.2 Determine the lines, grades and elevations for the installation of foundations, basement slab and walls, drilled foundations, slabs at grade, underground utilities and appurtenances as shown on the Contract Drawings.

3.1.1.3 Supply and set stakes to provide strict and accurate vertical and horizontal control of the work from monuments and benchmarks provided by the Buyer. Provisions shall be taken to protect the monuments and benchmarks from damage.

##### 3.1.2 Prior to Backfilling

3.1.2.1 All excavations shall be free of standing water, ice, frozen material or organic material, and the subgrade shall not contain frozen material, prior to placing backfill.

3.1.2.2 All exposed and excavated horizontal surfaces within a building and structure footprint shall be compacted to not less than 95 percent of its maximum dry density as determined in Paragraph 3.2.2.4.A. The horizontal surfaces of existing excavations need not be recompacted unless the subgrade is found not to be in conformance with the above requirements.

3.1.2.3 At locations beneath foundations, slabs at grade and appurtenances do not begin backfill operations until after the subgrade has been inspected, tested and approved by the Buyer.

3.1.2.4 Backfilling operations over or adjacent to foundations and behind walls shall not begin until the concrete work has been inspected, tested and accepted by the Buyer.

3.1.2.5 Backfilling operations over foundations may not begin until the concrete has cured for at least 7 days and the forms have been removed. In addition, do not backfill against concrete walls until the walls have reached their specified 28 day compressive strength as demonstrated by compression testing of molded concrete cylinders. Refer to Contract Drawings for additional restrictions on backfilling operations against concrete walls.

3.1.2.6 Backfilling operations for utility trenches shall not begin until the installed utilities have undergone all required tests and inspections, and the required as-builts have been obtained, except as specified elsewhere.

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- 3.1.2.7 Prior to placement of aggregate base course and rock surfacing, inspect and verify that the underlying subgrade has been properly compacted per Paragraph 3.2.2.4.B and graded.

3.2 **INSTALLATION, APPLICATION AND ERECTION**

3.2.1 Excavation

3.2.1.1 General

- A. All excavations shall be in accordance with Washington Administrative Code (WAC), Chapter 296-155, Section 650-664, "Excavation, Trenching and Shoring" and other applicable federal, state and local safety regulations. The side slopes below elevation 698.0 shall be 1.5 horizontal to 1 vertical and above elevation 698.0 shall be 2 horizontal to 1 vertical.
- B. Excavations shall be by the open-cut method. Precautions shall be taken not to damage the existing underground utilities.
- C. An imaginary 45° line extending downward and outward from the bottom corner of any existing foundation shall not intersect any intended excavation for adjacent foundations or utilities, unless noted otherwise on the Contract Drawings or approved by the Buyer. Seller shall support in place, shore or otherwise protect existing underground utilities or structures from damage due to Seller's operations.
- D. When freezing temperatures are expected, do not excavate to the full depth indicated on the Contract Drawings unless the bottom of the excavation is adequately protected from frost.
- E. Excess excavated material meeting the requirements of Paragraph 2.1.1 shall be stockpiled at a location designated by the Buyer for later use as backfill material. Material determined to be unsuitable for backfill shall be disposed of in an area designated by the Buyer.

3.2.1.2 Excavation for Foundations and Slabs at Grade

- A. Requirements specified in Paragraph 3.2.1.1 herein shall apply. Additional requirements shall be as specified below.
- B. The excavation shall be made to the size and depth required to install the foundations, slabs, walls and appurtenances to the lines and elevations shown on the Contract drawings.

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3.2.1.3 Excavation for Appurtenances

- A. Requirements specified in Paragraph 3.2.1.1 herein shall apply. Additional requirements shall be as specified hereinafter.
- B. Excavations for precast manholes, flange boxes and other appurtenances shall be of sufficient width and depth to install these items as shown on the Contract Drawings.

The depth of the excavation shall be sufficient to allow the placement of a minimum of 6 inches of compacted sand below the bottom of the precast manholes and flange boxes.

- C. Compact the bottom of the excavation in accordance with Paragraph 3.1.2.2.

3.2.1.4 Excavation for Utility trenches

- A. Requirements specified in paragraph 3.2.1.1 herein shall apply. Additional requirements shall be as specified below.
- B. Excavate trenches to widths and depths required to install the utilities as shown on Contract Drawings. Accurately grade the bottoms of trenches to provide uniform bearing and support for underground utilities and compact in accordance with Paragraph 3.1.2.2, except where it is necessary to excavate holes for bell or for proper sealing of joints. Excavate pipe trenches to at least 3 inches below the bottom of pipe elevation.

3.2.1.5 Drilled Pier Foundations

Drill holes for piers to the diameter and depth shown on the Contract Drawings. Bottom of the holes shall be level and free of loose material. Provide casing as required to prevent caving or sloughing during construction. Holes shall not be out of plumb by more than 1-1/2 inches in full depth.

3.2.1.6 Dewatering

Excavate in such a manner that the work area will be effectively drained. Drainage shall be by gravity whenever possible; utilize additional means when necessary, including pumping and bailing.

3.2.2 Backfilling

3.2.2.1 General

- A. Backfill material shall meet the requirements specified in Paragraph 2.1.1.1 unless noted otherwise in this specification section or on the Contract Drawings.
- B. Jetting of backfill is not permitted.
- C. Backfill material shall be moisture conditioned to within plus or minus 2 percent points optimum moisture content as determined in Paragraph 3.2.2.4.A. Scarifying or other methods may be required to obtain the required moisture content since water applied to the surface may not penetrate the full depth of the lift.
- D. Do not operate heavy equipment for spreading and compacting backfill within 5 feet of below-grade walls. The fill within this 5 foot strip shall meet the requirements of Paragraph 2.1.1.3 and shall be placed in maximum loose lifts of 6 inches and be compacted with a vibrating plate compactor, or drum compactor with a total static weight not exceeding 3000 pounds.
- E. Backfill shall be placed to the lines and contours matching the adjacent grade and as shown on the Contract Drawings.

3.2.2.2 Backfilling for Foundations, Slabs at Grade and Appurtenances

- A. Requirements specified in Paragraph 3.2.2.1 herein shall apply.
- B. Backfill material shall be placed in maximum loose lifts of 8 inches and compacted in accordance with Paragraph 3.2.2.4.
- C. Place sand conforming to Paragraph 2.1.1.2 under all precast manholes and flange boxes. A minimum thickness of 6 inches, compacted to 95 percent of its maximum dry density as determined in Paragraph 3.2.2.4.A, shall be placed.

3.2.2.3 Backfilling of Utility Trenches

- A. Requirements specified in Paragraph 3.2.2.1 herein shall apply. Additional requirements shall be as specified below.
- B. Where utilities are coated for protection against corrosion, perform backfilling and tamping in such a manner that the coating will not be damaged. Damaged coatings shall be repaired or replaced by Seller.

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- C. Direct burial cables shall be bedded in a cushion of sand conforming to Paragraph 2.1.1.2, not less than 3 inches on all sides. Direct burial conduit shall be buried directly in backfill material conforming to Paragraph 2.1.1.1. Other utilities shall be bedded in 3 inches of bedding materials conforming to Paragraph 2.1.1.5.
  - D. When pressure testing of underground pipe is required the trench shall not be backfilled to more than 2 feet above the top of pipe until the pressure tests have been performed. The joints and couplings shall be left uncovered during the pressure test. Upon the satisfactory completion of the test backfill operations may resume.
  - E. Deposit backfill material in the trench for its full width on each side of the underground utilities and appurtenances simultaneously. Use special care in placing initial layers of the backfill, so as to avoid damage or movement of the utility.
  - F. From the top of the bedding material to a depth of not less than two feet over sewers, direct burial wires, conduit, and underground piping; and not less than one foot over other utilities, backfill shall be placed in maximum loose lifts of 6 inches and compacted in accordance with Paragraph 3.2.2.4B. Compaction shall be achieved through the use of hand tamping or a power operated hand vibrating compactor such as a vibrating plate compactor or drum compactor with a total static weight not exceeding 3000 pounds.
  - G. Place markers and wood boards or concrete protection over underground electrical utilities as shown on the Contract Drawings.  
  
Place buried warning and identification tape conforming to Paragraph 2.1.5 over the centerline of the underground utility at a depth of 12 inches below finished grade or as shown on the Contract Drawings.
  - H. Place the remainder of the backfill material in maximum loose lifts of 8 inches and compact in accordance with Paragraph 3.2.2.4.B.
  - I. Backfilling for plastic pipe shall conform to the requirements of ASTM D2774 for sanitary water line and FM Data Sheet 3-10 for fire water lines.



3.2.2.4 Compaction of Backfill

- A. Determine the moisture density relationship in accordance with ASTM D1557 for each type of soil used for backfill. Corrections to adjust the laboratory maximum dry density and optimum moisture content for soil with oversize particles shall be made in accordance with ASTM D4718. Onsite soil with more than 30 percent of the material retained on a 3/4-inch sieve shall be tested in accordance with WSDOT 606 provided in M46-01.
- B. Compact each lift to not less than 95 percent of its maximum dry density as determined in Paragraph 3.2.2.4.A. Aggregate base course shall be compacted to not less than 95 percent of its maximum dry density. Each layer of rock surfacing shall be compacted by at least two passes of a vibratory compactor approved by the Buyer.
- C. Compaction requirements shall be as identified here or as otherwise shown on the Contract Drawings.

3.2.3 Tolerances

All excavation and backfill shall be made to the dimensions and elevations shown on the Contract Drawings plus or minus 1 inch.

3.2.4 Vapor Barriers

Install polyethylene sheets for vapor barrier in continuous sheets, lapping joints 6" minimum. Cross section shall be sand cushion conforming to Paragraph 2.1.1.2, over polyethylene sheet over aggregate base conforming to Paragraph 2.1.2, as shown on the Contract Drawings.

3.3 FIELD QUALITY CONTROL

3.3.1 The Buyer shall ensure specified field tests are performed independently from the work being carried out to verify the work is accomplished in accordance with this specification section and the Contract Drawings. The Seller shall coordinate the work performed with specified testing activities.

3.3.2 Field density tests shall be performed in accordance with ASTM D1556, ASTM D2167 or ASTM D2922. When tests are performed by the Nuclear Method per ASTM D2922, at least 20 percent of the tests shall be performed in accordance with ASTM D1556 or ASTM D2167 methods.

3.3.3 Field density tests are required for each method of compaction utilized and for each type of fill material used.

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3.3.4 The minimum number of field density tests shall be as follows:

- A. Below foundations, underground structures and slabs at grade; one test, per lift, per 1500 square feet of area with a minimum of one test at each installation; one test, per 1500 square feet of area for exposed and excavated horizontal surfaces.
- B. Over and adjacent to foundations, underground structures and slabs at grade; one test, per lift, per 3000 square feet of area with a minimum of one test at each installation; one test per 3000 square feet of area for exposed and excavated horizontal surfaces.
- C. One test per lift per day.
- D. One test per lift per 3000 square feet of area for aggregate base course.
- E. One test per lift per 200 lineal feet for trenches.
- F. No tests are required for rock surfacing.

3.3.5 Any areas failing to meet compaction requirements shall be recompact and retested. If required compaction cannot be obtained, the material shall be removed, replaced, recompact and tested.

3.4 **ADJUSTMENTS**

(Not Used)

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

SECTION 03200  
CONCRETE REINFORCEMENT  
(B-595-C-B210A-03200)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA	YES	<u>  </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>X</u>	II	<u>  </u>
SAFETY CLASS	1	<u>X</u>	2	<u>  </u>
			3	<u>  </u>
			4	<u>  </u>

ORIGINATOR:

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M. S. Whitten 11/11/92  
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G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/11/92  
Date

NOV 16 1992

**SECTION 03200  
CONCRETE REINFORCEMENT**

This addendum modifies the Project Standard Specification Section by addition, deletion, and/or revision for the purpose of conveying the package specific requirements of the HWVP project. The type of modification shall be defined, and indicated in subsequent text, as follows:

- (Addition) - Indicates the following statement(s) is/are added to the referenced text.
- (Deletion) - Indicates the following statement(s) is/are deleted from the referenced text.
- (Revisions) - Indicates the following statement(s) is/are revision(s) to the referenced text.

**PART 1 GENERAL**

- 1.2 (Deletion) ASTM A185
- 1.6.1 (Revision) Delete "and welded wire fabric" in second line.

**PART 2 PRODUCTS**

- 2.1.1.2 (Deletion)
- 2.1.3.2 (Revision) Delete "including load bearing pad on bottom to prevent vapor barrier puncture."

**PART 3 EXECUTION**

- 3.2.1.3 (Deletion)
- 3.2.1.5 (Deletion)

SECTION 03200  
CONCRETE REINFORCEMENT  
B-595-STD-03200

APPROVED FOR CONSTRUCTION

REVISION 0  
ISSUE DATE           

WAPA YES      NO X  
QUALITY LEVEL I X II       
SAFETY CLASS 1 X 2      3      4     

ORIGINATOR:

CHECKER:

M. S. Whitten 11/12/92  
M. S. Whitten, Structural Engineer Date

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G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/12/92  
Date

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SECTION 03200  
CONCRETE REINFORCEMENT  
B-595-STD-03200

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**SECTION 03200  
CONCRETE REINFORCEMENT**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section covers the technical requirements for the furnishing, installation, and testing of reinforcing steel and mechanical connectors for cast-in-place concrete.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN CONCRETE INSTITUTE (ACI)**

ACI 301                      1989 Specification for Structural  
Concrete for Buildings

ACI SP-66                  1988 ACI Detailing Manual

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A185                  1990 Standard Specification for Steel  
Welded Wire Fabric, Plain, for Concrete  
Reinforcement

ASTM A370                  1990 (Rev. A) Standard Test Methods and  
Definitions for Mechanical Testing  
of Steel Products

ASTM A615                  1990 Standard Specification for Deformed  
and Plain Billet-Steel Bars for Concrete  
Reinforcement

**1.3 RELATED REQUIREMENTS**

(Not Used)

**1.4 DEFINITIONS**

(Not Used)

**1.5 SYSTEM DESCRIPTION**

(Not Used)

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1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Shop fabrication and placement drawings prepared in accordance with ACI SP-66.

These drawings shall indicate bar sizes, spacings, locations and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, supporting and spacing devices (especially, for top reinforcing in thick mats and slabs), as well as complete placing information such as the required concrete cover and the location of splices and construction joints.

1.6.2 Certified Material Test Reports (CMTRs) documenting the conformance of all materials supplied to the applicable ASTM requirements specified in Paragraph 2.1.1.

1.6.3 Documentation of the material tests specified in Paragraph 2.2.7.

1.6.4 Documentation of the performance tests, specified in Paragraph 2.1.2.3, verifying the performance of bar splices made with mechanical connectors.

1.6.5 Splice procedures developed according to Paragraph 2.1.2.4 to be used in making bar splices with mechanical connectors.

1.6.6 Documentation of the certification of each person involved in making a bar splice with a mechanical connector per Paragraph 2.1.2.5.

1.6.7 Inspection reports documenting that bar splices made with mechanical connectors, as required in Paragraph 3.3.1 were made in compliance with the approved splicing procedures by qualified splicers.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)



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## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 Reinforcement

2.1.1.1 Reinforcing Steel: ASTM A615, Grade 60; deformed billet steel bars, plain finish.

2.1.1.2 Welded Wire Fabric: ASTM A185 Plain Type; in flat sheets or coil rolls; plain finish.

#### 2.1.2 Mechanical Connectors

2.1.2.1 Mechanical connectors for splicing reinforcing steel shall be Lenton taper threaded rebar splices by Erico Products or equal. Mechanical connectors shall have compatible accessories for mounting flush to formwork including internal coupler protectors and external bar end protectors.

2.1.2.2 Mechanical connectors shall develop in tension or compression at least 125 percent of the specified yield strength of the reinforcing steel.

2.1.2.3 Mechanical connectors for each bar size and splice type to be used in construction shall be qualified for use based on the following performance tests:

- A. Static Tensile Strength Tests - Six splice specimens of the bar-to-bar connection for each bar size and grade shall be subjected to tensile strength tests in accordance with ASTM A370 test methods. Conduct a tensile strength test on an unspliced specimen from the same bar used for the spliced specimen to establish the actual yield and tensile strength of each bar.

All test specimens shall meet the requirements of Paragraph 2.1.2.2. Each individual test report on both the spliced and unspliced specimens shall include at least the following information:

- 1) Yield strength
- 2) Tensile strength
- 3) Total elongation
- 4) Load-elongation curve or data up to failure load
- 5) Mode of failure.

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The gauge length for each pair of spliced and unspliced specimens shall be the same, and equal to the length of the splice sleeve plus one to three bar diameters at each end.

- B. Cyclic Tests - Three splice specimens of the bar-to-bar connection for each bar size and grade shall be subjected to 100 cycles of tensile stress variations from 5 percent to 90 percent of the specified minimum yield strength of the reinforcing bar. One cycle is defined as an increase from the lower load to the higher load and return.

The specimens shall withstand the cyclic test without loss of static tensile strength capability when compared with like specimen in A. above and tested statically to failure following cyclic tests.

- 2.1.2.4 Procedures for producing a splice shall be developed by Seller in accordance with recommendations of the manufacturer of the mechanical connector and shall include, as a minimum, the following information:

- A. Procedures used for performance tests
- B. Type of equipment and methods used to verify bar thread acceptability
- C. Cleanliness requirements
- D. Type of equipment and methods used for torquing
- E. Required torque, tolerance on required torque, and method of measurement
- F. Method used to lock the coupling in place to prevent loosening of the splice
- G. Method used to verify the final alignment and engagement of the splice coupler on both bars

- 2.1.2.5 Personnel (splicer) involved in the production of the splices shall be trained and certified to follow the procedures developed per Paragraph 2.1.2.4, prior to performing any production splices. Initial training and certification shall be by the manufacturer. Additional personnel may be trained and certified by the Seller's personnel who have been trained and certified by the manufacturer.

- 2.1.3 Accessory Materials

- 2.1.3.1 Tie Wire: Minimum 16 gauge, black, annealed type.

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2.1.3.2 Chairs, bolsters, bar supports, dobies, spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

2.1.3.3 Special chairs, bolsters, bar supports, spacers adjacent to weather exposed concrete surfaces (not in contact with soil): Plastic coated steel type; size and shape as required.

## 2.2 FABRICATION AND MANUFACTURE

2.2.1 Fabricate concrete reinforcing steel in accordance with the standard fabricating tolerances in ACI SP-66 and to the dimensions shown on the Contract Drawings.

2.2.2 All reinforcement shall be bent cold.

2.2.3 Store reinforcing steel off the ground and protect from oil or other deleterious materials.

2.2.4 Rust, seams, surface irregularities, or mill scale will not be cause for rejection, provided the weight and height of deformations of a hand-wire-brushed test specimen are not less than the applicable ASTM specification requirements.

2.2.5 Tag bundles of reinforcing bars and mechanical couplers showing quantity, grade, size, heat number, and suitable identification to allow checking, sorting and placing; use embossed metal tags.

2.2.6 Mechanical couplers and bar threads shall be protected from damage during shipping, handling and installation.

2.2.7 Tension tests of reinforcing steel shall be provided in accordance with ASTM A615 for each 50 tons or lesser quantities of each bar size produced from each heat of steel.

## PART 3 EXECUTION

### 3.1 PREPARATION

Clean reinforcement prior to installation to remove loose rust and mill scale (removable with a wire brush), earth, ice and other materials which may reduce or destroy the bond with the concrete.

### 3.2 INSTALLATION, APPLICATION AND ERECTION

#### 3.2.1 Placement

3.2.1.1 Place, support and secure all reinforcement to prevent displacement from its required position. Reinforcement placing tolerances

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shall meet the requirements of ACI 301 Chapter 5. Bars shall be tied securely to prevent displacement and all dowels shall be securely held in place prior to depositing concrete.

- 3.2.1.2 Splice reinforcement as indicated on the approved placement drawings.
- 3.2.1.3 Care shall be taken to not displace or puncture the vapor barrier where shown on the Contract Drawings.
- 3.2.1.4 Accommodate placement of formed openings.
- 3.2.1.5 Splices in welded wire fabric shall be made by lapping a minimum of one spacing of the outermost cross wires of each fabric plus 2 inches unless noted otherwise on the placement drawings.
- 3.2.1.6 Do not field bend reinforcing bars partially embedded in concrete, except as shown on the placement drawings.
- 3.2.1.7 Maintain concrete cover around reinforcing as specified on the placement drawings.
- 3.2.2 Mechanical Connectors
  - 3.2.2.1 Mechanical connectors for splicing reinforcing steel shall be placed and tightened in accordance with the splicing procedures of Paragraph 2.1.2.4 by personnel trained and qualified per Paragraph 2.1.2.5.
  - 3.2.2.2 Internal coupler protectors and external bar end protectors shall not be removed until a mechanical connection is ready to be made.

### 3.3 FIELD QUALITY CONTROL

The Buyer shall ensure specified field tests are performed independently from the work being carried out to verify the work is accomplished in accordance with this specification section and the Contract Drawings. The Seller shall coordinate the work performed with specified testing activities.

- 3.3.1 All splices made with mechanical connectors shall be inspected to verify that installation is in compliance with the approved production splicing procedures.
- 3.3.2 Field testing of completed connections is not required.

### 3.4 ADJUSTMENT

(Not Used)

### 3.5 CLEANING

(Not Used)

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3.6            **PROTECTION**

(Not Used)

3.7            **DEMONSTRATION**

(Not Used)

3.8            **SCHEDULES**

(Not Used)

**END OF SECTION**

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SECTION 03252  
CONCRETE ANCHORS  
(B-595-C-B210A-03252)

"APPROVED FOR CONSTRUCTION"

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WAPA YES    NO X  
QUALITY LEVEL I X II     
SAFETY CLASS 1    2    3 X 4   

ORIGINATOR:

CHECKER:

M. S. Whitten 11/11/92  
M. S. Whitten, Structural Eng. Date

G. Kuilanoff 11/11/92  
G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/11/92  
Date

SECTION 03252  
CONCRETE ANCHORS

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## SECTION 03252 CONCRETE ANCHORS

### PART 1 GENERAL

#### 1.1 SUMMARY

This section covers the technical requirements for the furnishing and installation of concrete anchors. Concrete anchors are considered to be anchor bolts installed in fresh concrete.

#### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

##### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M	1990 Standard Specification for Structural Steel
ASTM A153	1982 (R1987) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A193/A193M	1990 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194/A194M	1990 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A240	1991 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A307	1990 Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength
ASTM A563	1991 Standard Specification for Carbon and Alloy Steel Nuts
ASTM F436	1990 Standard Specification for Hardened Steel Washers



1.3 RELATED REQUIREMENTS

Specification Section 05059 Welding - Stainless Steel Liners

Specification Section 05123 Miscellaneous Metals

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certified Material Test Reports (CMTRs) documenting the conformance of all materials as specified in Paragraph 2.1.1.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Anchor Bolts

Unless noted otherwise on the Contract Drawings, an anchor bolt assembly shall consist of a bolt threaded at both ends supplied with 2 heavy hex nuts, one for each end (an acceptable alternate to a threaded bolt with a bottom nut is a heavy hex head bolt), and one washer (only when specified on the Contract Drawings), conforming to the following requirements:

Carbon Steel

Anchor Bolts	-	ASTM A307	Grade C, or A36
Heavy Hex Nuts	-	ASTM A563	Grade A
Hardened Washers	-	ASTM F436	
Heavy Hex Head Bolt	-	ASTM A307	Grade B (Optional)

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When galvanized anchor bolts are specified on the Contract Drawings, anchor bolts, nuts and washers shall be galvanized in accordance with ASTM A153.

#### **Stainless Steel**

Anchor Bolts	-	ASTM A193	Grade B8
Heavy Hex Nuts	-	ASTM A194	Grade B
Washers	-	ASTM A240	Type 304L

#### **2.1.2 Sleeves**

Sleeves for anchor bolts shall conform to the requirements specified on the Contract Drawings.

#### **2.2 FABRICATION AND MANUFACTURE**

2.2.1 Fabricate anchor bolts to the dimensions and details shown on the Contract Drawings. All anchor bolt and nut thread engagement shall be inspected prior to shipment or installation.

2.2.2 Anchor bolts shall be bundled and tagged showing quantity, grade, size and suitable identification to allow checking, sorting and proper placement in the field; use embossed metal tags. Carbon steel and stainless steel anchor bolts shall be bundled separately.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

(Not Used)

#### **3.2 INSTALLATION, APPLICATION AND ERECTION**

3.2.1 Location of concrete anchors, anchor quantity, anchor diameter and anchor type shall be as shown on the Contract Drawings.

3.2.2 Relocation of a concrete anchor from the position shown on the Contract Drawings requires the approval of the Buyer.

3.2.3 Welding to concrete anchors is not allowed except welding of the bottom nut as shown on the Contract Drawings. Such welding shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners, as applicable for carbon steel.

3.2.4 Install anchor bolts in cast-in-place concrete in accordance with the details and tolerances indicated on the Contract Drawings.

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3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

SECTION 03300  
CAST-IN-PLACE CONCRETE  
(B-595-C-B210A-03300)

"APPROVED FOR CONSTRUCTION"

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ISSUE DATE 11-12-92

WAPA YES    NO X  
QUALITY LEVEL I X II     
SAFETY CLASS 1 X 2    3    4   

ORIGINATOR:

CHECKER:

M. S. Whitten 11/11/92  
M. S. Whitten, Structural Engineer Date

G. Kuilanoff 11/11/92  
G. Kuilanoff, Structural Engineer Date

APPROVED BY:

R. P. Kumar  
R. P. Kumar Lead Discipline Engineer

11/11/92  
Date

SECTION 03300  
CAST-IN-PLACE CONCRETE

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**SECTION 03300  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section covers the technical requirements for installation, inspection and testing of cast-in-place concrete for buildings and appurtenances as shown on the Contract Drawings.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

**AMERICAN CONCRETE INSTITUTE (ACI)**

ACI 301	1989 Specification for Structural Concrete for Buildings
ACI 304R	1989 Guide for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	1989 Hot Weather Concreting
ACI 306R	1988 Cold Weather Concreting
ACI 347R	1988 Guide to Formwork for Concrete
ACI SP-4	1989 Formwork for Concrete

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM D412	1987 Standard Test Methods for Rubber Properties in Tension
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**1.3 RELATED REQUIREMENTS**

Specification Section 03010	Metallic Topping
Specification Section 03200	Concrete Reinforcement
Specification Section 03252	Concrete Anchors
Specification Section 05059	Welding - Stainless Steel Liners
Specification Section 05123	Miscellaneous Metals

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Specification Section 07160 Bituminous Dampproofing  
Specification B-595-A-A900-03346 Ready-Mixed Concrete Production  
and Delivery  
Specification B-595-A-A910-01650 Inspection and Testing Services

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEMS DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Concrete placement schedule per Paragraph 3.2.4.2.

1.6.2 Jobsite records of placed concrete per Paragraph 3.2.4.6 and documentation on inspection per Paragraph 3.3.2.

1.6.3 Documentation of testing as defined in Paragraph 3.3.1.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Concrete

2.1.1.1 Concrete shall be mix design classes from Table 1 of Specification B-595-A-A900-03346, Ready-Mixed Concrete Production and Delivery. Use mix design classes as specified on the Contract Drawings or as specified below.

2.1.1.2 Concrete specified as Mix Design Class MC3, MC3P, ST4 and ST4P on the Contract Drawings shall have a minimum dry density of 147 pounds per cubic feet to satisfy radiation shielding requirements.

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2.1.1.3 Concrete for underground duct banks shall be Mix Design Class M. The top surface of all underground duct banks shall be colored red. The color may be applied by sprinkling red iron oxide powder over freshly poured concrete at the rate of 0.1 pounds per square foot of concrete surface, or painting the surface after concrete has hardened and cured.

2.1.2 Reinforcement

Reinforcement shall be in accordance with Specification Section 03200, Concrete Reinforcement.

2.1.3 Concrete Anchors

Concrete Anchors shall be in accordance with Specification Section 03252, Concrete Anchors.

2.1.4 Steel Embedments

Steel embedments shall be in accordance with Specification Section 05123, Miscellaneous Metals.

2.1.5 Waterstop

Waterstop shall be 3/8-inch thick dumbbell type of styrene-butadiene synthetic rubber, and the widths shown on the Contract Drawings. Polyvinyl chloride or other non-rubber materials are not acceptable substitutions. Tensile strength shall be 3000 psi minimum and ultimate elongation shall be 450 percent minimum when tested per ASTM D412. Field splices shall be made in accordance with manufacturers instructions.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Obtain pre-placement inspection and authorization from the Buyer before proceeding with concrete placement.

3.1.2 Prior to placing concrete verify that all reinforcing steel including concrete cover, anchor bolts and other embedded items are accurately placed and secured in accordance with the Contract and Fabrication Drawings.



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- 3.1.3 Construction joints shall be as shown on the Contract Drawings and prepared in accordance with ACI 301, Section 6.1 and Section 8.5. Modify Section 6.1.4.3 as follows: Roughen the concrete surface uniformly to a full amplitude of approximately 1/4 inch in a manner that will remove laitance, loosened aggregate or damaged concrete at the surface. Where metal forms, such as "Stay-Form" are used, all loose material shall be removed and the joint shall be prepared as stated above except that the 1/4" amplitude roughness is provided by the form configuration.
- 3.1.4 Remove laitance and concrete splatter from protruding reinforcing steel after each concrete placement.
- 3.1.5 All equipment for transporting concrete shall be clean and free of hardened concrete. Do not use equipment made of aluminum or aluminum alloys to mix, handle, convey or place concrete.
- 3.1.6 All debris and ice shall be removed from spaces to be occupied by concrete. Concrete shall not be cast against frozen surface.
- 3.1.7 Forms shall be properly coated and prepared in accordance with Section 4.4 of ACI 301. Form release agents shall be water base type.
- 3.1.8 Reinforcement shall be clean of ice, earth, loose rust and mill scale or other deleterious coatings.
- 3.1.9 Standing or puddled water shall be removed from place of deposit before concrete is placed.
- 3.2 **INSTALLATION, APPLICATION AND ERECTION**
- 3.2.1 **Formwork**
- 3.2.1.1 Formwork design and installation shall be in accordance with ACI 301, Chapter 4, ACI 347R and ACI SP-4. Tolerances on formed surfaces shall be in accordance with ACI 301, Table 4.3.1, except that the interior surface of the canyon walls shall not exceed a variance from plumb of 1/4 inch in any 10 feet of height or length, nor 1/2 in total height (from base mat to underside of second floor hatch covers) or length. Form exposed exterior corners above grade of structures and foundations with a one inch by one inch chamfer unless noted otherwise on the Contract Drawings.
- 3.2.1.2 Formwork with a stainless steel liner included shall be sufficiently rigid to satisfy the flatness requirement specified in Specification Section 05123, Miscellaneous Metals.
- 3.2.1.3 Do not attach any temporary or forming attachments of carbon steel material to embedded items of stainless steel material.

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- 3.2.1.4 Do not remove forms and shoring used to support the vertical weight of concrete until the concrete has reached a minimum compressive strength of 4000 psi.
- 3.2.1.5 Do not remove forms and shoring used to support the lateral weight of concrete until the concrete has reached a compressive strength of 2000 psi.
- 3.2.1.6 The concrete shall be presumed to have attained the specified strength for form removal when the requirements of ACI 301, Section 4.7 have been met.
- 3.2.1.7 Do not remove forms used for curing before the expiration of the required curing period.
- 3.2.1.8 Remove temporary attachments to embedded items such as lifting pads, erection brackets and alignment mounts by machining or grinding. Restore surfaces of the embedded items to the original condition by grinding or by welding followed by grinding in accordance with Specification Section 05059, Welding - Stainless Steel Liners.
- 3.2.2 Placing Reinforcement
- Place reinforcement in accordance with Specification Section 03200, Concrete Reinforcement.
- 3.2.3 Placing Concrete Anchors
- Place concrete anchors in accordance with Specification Section 03252, Concrete Anchors.
- 3.2.4 Placing Concrete
- 3.2.4.1 Place concrete in accordance with ACI 301, Chapter 8, except as modified by the supplemental requirements herein.
- 3.2.4.2 Prepare concrete placement drawing for each concrete pour for Buyer's approval. The drawing shall address the following items:
- A. Pour number
  - B. Extent of pour, plan and elevation views
  - C. Volume of concrete
  - D. Reference to concrete mix class and applicable submitted reinforcing steel placing drawings

- E. Location of all embedded items such as plates, frames, pipe sleeves, inserts, conduit, anchor bolts and construction aids
- F. Openings
- G. Construction joint preparation and surfacing
- H. Materials and methods of curing
- I. Formwork removal timing and sequence

- 3.2.4.3 Concrete conveying by pumping shall meet the requirements of ACI 304R, Chapter 9. Concrete conveying by belt conveyors shall meet the requirements of ACI 304R, Chapter 10.
- 3.2.4.4 When the ambient temperature is below 40°F or expected to be below 40°F within 24 hours thereafter of concrete placement, the provisions of ACI 306R shall be followed.
- 3.2.4.5 When the ambient temperature is above 90°F or expected to be above 90°F at time of concrete placement, the provisions of ACI 305R shall be followed.
- 3.2.4.6 Maintain a jobsite record of placed concrete. Record date, time, location, quantity, air temperature, concrete temperature, delivery slip number and cylinder sample numbers.
- 3.2.4.7 After concrete placement and form removal, clean exposed reinforcing steel and embedded items of concrete splatter, dirt and other foreign matter. Mechanical cleaning tools used on stainless steel surfaces, such as grinding wheels, files, deburring tools and wire brushes, shall be made of stainless steel. Markings on these tools shall identify tools to be used on stainless steel only and be visible while tool is in use.
- 3.2.4.8 Seller shall leave construction joints for future contractors, prepared in accordance with the requirements of Paragraph 3.1.3.
- 3.2.4.9 Concrete that has achieved initial set or has been contaminated by foreign materials shall not be deposited in the structure. Retempered concrete shall not be used.
- 3.2.4.10 The Vitrification building concrete mat, walls and the first floor shall be considered as massive concrete and provisions of ACI 301 Chapter 14, Paragraph 14.4 for placing shall apply.
- 3.2.5 Finishing Formed Surfaces
  - 3.2.5.1 Finish formed surfaces in accordance with ACI 301, Chapter 10, except as modified by the supplemental requirements herein.

- 3.2.5.2 All interior formed surfaces and all exterior formed surfaces which remain visible or exposed to public view shall have a "smooth form finish."
- 3.2.5.3 Formed surfaces exposed to earth, may have a "rough form finish."
- 3.2.5.4 Concrete walls exposed to earth shall receive a bituminous coating in accordance with Specification Section 07160, Bituminous Dampproofing.
- 3.2.6 Slabs
- 3.2.6.1 Construct slabs in accordance with ACI 301, Chapter 11, except as modified by the supplemental requirements herein.
- 3.2.6.2 Slabs shall have a "trowelled finish" and be finished to a "Class A Tolerance," unless noted otherwise on the Contract Drawings.
- 3.2.6.3 Slabs noted to be poured to a "rough pour elevation" and to receive a concrete topping, shall have a "floated finish" and be finished to a "Class B Tolerance," unless noted otherwise on the Contract Drawings.
- 3.2.6.4 Finish or prepare the concrete floor surface receiving metallic topping in accordance with Specification Section 03010, Metallic Topping.
- 3.2.7 Curing and Protection
- 3.2.7.1 Cure and protect concrete in accordance with ACI 301, Chapter 12, except as modified by the supplemental requirements herein.
- 3.2.7.2 For massive concrete as defined in Paragraph 3.2.4.10, cure and protect concrete in accordance with ACI 301, Chapter 14, Paragraph 14.5.
- 3.2.7.3 Concrete surfaces not in contact with forms can utilize any of the methods indicated in ACI 301, Section 12.2.1, for preservation of moisture, except slabs to receive a metallic topping shall not be cured with a curing compound.
- 3.2.8 Patching
- Repair of surface defects shall be performed only with the approval of the Buyer and shall be performed in accordance with ACI 301, Chapter 9.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 Testing

3.3.1.1 The Buyer shall ensure specified field tests are performed independently from the work being carried out to verify the work is accomplished in accordance with this specification section and the Contract Drawings. The Seller shall coordinate the work performed with specified testing activities. Concrete testing is defined in Specification B-595-A-A910-01650, Inspection and Testing Services, Paragraph 3.2.2 and below:

- A. Tests for slump, air content and concrete temperature shall be made for the first delivery of each class of concrete each day and every 50 cubic yards thereafter.
- B. Tests for slump, air content, concrete temperature and unit weight shall be made for each strength test.
- C. At least one strength test shall be made per day for each class of concrete placed.
- D. For structures and foundations at least one strength test shall be made per 150 cubic yards or per 5000 square feet of surface area of slabs or walls, whichever is less.
- E. A test for the dry density of Mix Design Class MC3, MC3P, ST4 and ST4P shall be made once each day for the first delivery of each class of concrete.

3.3.1.2 In-place concrete, tests of which, do not meet the requirements of ACI 301, Section 17.2, shall be subject to further tests as directed by the Buyer. Such testing may include the testing of core cylinders taken from the completed work, or the performance of load tests.

#### 3.3.2 Inspection

3.3.2.1 Reinforcing bar placement, concrete cover, formwork preparation and position of embedded items shall be inspected for compliance with the Contract Drawings prior to the placement of the concrete.

3.3.2.2 The concrete shall be inspected immediately upon the removal of the forms for honeycombs or embedded debris. Repair surface defects per Paragraph 3.2.8.

3.3.2.3 The concrete shall be inspected to ascertain that concrete work is performed in compliance with the requirements of this specification section and the Contract Drawings.

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3.3.3 Evaluation and Acceptance

The evaluation and acceptance of the concrete work shall meet the requirements of ACI 301, Chapters 17 and 18.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 03010  
METALLIC TOPPING  
(B-595-C-B210A-03010)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA YES    NO X  
QUALITY LEVEL I    II X  
SAFETY CLASS 1    2    3 X 4   

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11/11/92  
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SECTION 03010  
METALLIC TOPPING  
(B-595-C-B210A-03010)

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**SECTION 03010  
METALLIC TOPPING**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section covers technical requirements for the preparation of concrete floor surfaces and the furnishing and installation of traffic topping.

Traffic topping shall be a pre-proportioned, pre-mixed, factory packaged, heavy-duty metallic aggregate floor topping providing protection against abrasion and impact. The system shall be capable of sustaining loads imposed by an eight-wheeled transport vehicle weighing approximately 340,000 pounds and shall be impervious to fluids and chemicals which might exude therefrom (e.g., brake fluid, hydraulic fluid, diesel fuel, etc.). The system shall remain effective for not less than 40 years. The system shall be capable of sustaining a vertical deflection of one inch in 50 feet of span without adverse effect on integrity and chemical resistance.

Metallic topping is indicated on Drawing Number H-2-117461.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN CONCRETE INSTITUTE (ACI)**

ACI 503R                      1989 Use of Epoxy Compounds with Concrete

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM C109                      1990 Standard Test Method for Compressive  
Strength of Hydraulic Cement Mortars  
(Using 2-inch or 50 mm Cube Specimens)

ASTM C131                      1989 Standard Test Method for Resistance  
to Degradation of Small-Size Coarse  
Aggregate by Abrasion and Impact in the  
Los Angeles Machine

ASTM C309                      1991 Standard Specification for Liquid  
Membrane Forming Compounds for Curing  
Concrete

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ASTM C779	1989 Rev. A Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
ASTM D2240	1986 Standard Test Method for Rubber Property - Durometer Hardness
ASTM D4258	1983 Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4259	1988 Standard Practice for Abrading Concrete
ASTM D4263	1983 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE RP0172	1972 Surface Preparation of Steel and Other Hard Materials by Water Blasting Prior to Coating or Recoating
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1.3 RELATED REQUIREMENTS

Specification Section 01730 Operation and Maintenance Data  
Specification Section 03300 Cast-in-Place Concrete

1.4 DEFINITIONS

1.4.1 Metallic Aggregate

Size graded, processed iron aggregate.

1.4.2 Green Concrete

Concrete less than 3 days old.

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and  
Data Requirements section of the Order/Subcontract:

1.6.1 Product Data Including Material Safety Data Sheets (MSDS)

1.6.1.1 Topping

1.6.1.2 Curing Material

1.6.1.3 Epoxy Bonding Agent

1.6.1.4 Bonding Compound

1.6.1.5 Joint Filler

1.6.2 Samples

Submit samples of material and acceptable finish for review by Buyer before starting work.

1.6.3 Test Reports

Submit test reports made within the previous three years of the date of issue of this section on samples of the products herein described. Such test reports shall be by nationally recognized laboratories or laboratories acceptable to the Buyer. Test Reports shall include dates of testing, locations from which samples were obtained, and test results including compressive strengths, abrasion resistance, impact resistance, and bond strengths of epoxy bonding agent.

1.6.4 Sample Panels or Sample Installations

Install in a location designated by the Buyer, a minimum of 100 square feet. The installation procedure is of prime importance. When approved by the manufacturer's representative and the Buyer, maintain the same controls and procedures throughout the remainder of the job. All work must be of the quality approved in the sample area.

1.6.5 Operation and Maintenance (O&M) Manuals

Submit manufacturer's printed maintenance instructions in accordance with Specification Section 01730, "Operation and Maintenance Data". The submittal shall include a list of local service companies.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

1.9 DELIVERY, STORAGE, AND HANDLING

1.9.1 Deliver materials to the job site in the manufacturer's original, unopened packages, with labels intact, legible, and conspicuous. Provide the following information with all deliveries:

1.9.1.1 Name or title of material;

1.9.1.2 Manufacturer's name, stock number, and date of manufacture;

1.9.1.3 Application instructions;

1.9.1.4 Material Safety Data Sheets (MSDS) complete for each shipment.

1.9.2 Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 35°F.

1.10 QUALITY ASSURANCE

1.10.1 Materials

All materials of the metallic topping system, including topping, curing material, bonding agent, bonding compound, joint filler, and other additives shall be products of a single manufacturer. Application of multiple manufacturers' products is strictly prohibited.

1.10.2 Installer

The metallic topping specified in this section shall be prepared and installed by a single installer approved by the manufacturer of the materials and having a minimum of five continuous years experience installing metallic toppings. Documentation supporting the required experience shall be submitted to the Buyer to demonstrate experience on projects of similar size and complexity.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General

The products herein described are manufactured by Master Builders, Inc. (Cleveland, Ohio); or by The Euclid Chemical Company (Cleveland, Ohio). They are intended to establish minimum acceptable standards of quality of materials, finish, or

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workmanship, and are not intended to exclude from consideration comparable products of other manufacturers. Products of other manufacturers will be permitted provided such materials are of equal quality and of the required characteristics for the purpose intended, subject to authorization by the Buyer.

#### 2.1.2 Topping

"Anvil-Top 300"; "Super Euco-Top"; processed iron aggregate topping consisting of specially processed, size graded iron aggregate (not a naturally occurring mineral aggregate), cement, and technical components necessary to produce screedable, metallic floor topping. Material shall be ready to use and require only addition of potable water at jobsite, and shall be sealed in moisture resistant bags. Material shall be free from non-ferrous particles, rust, and materials intended to disguise rust.

##### 2.1.2.1 Slump

Slump shall be 5 to 7 inches screedable consistency.

##### 2.1.2.2 Compressive Strength

The minimum compressive strengths of 2 (two) inch cubes tested in accordance with ASTM C109 shall be:

7,000 psi at 1 day  
9,000 psi at 3 days  
10,000 psi at 7 days  
12,000 psi at 28 days

##### 2.1.2.3 Abrasion Resistance

When tested in accordance with ASTM C779, 60 minutes of abrasion shall not exceed 0.009 inch.

##### 2.1.2.4 Impact Resistance

When tested in accordance with ASTM C131 (Los Angeles Rattler Test), 2,000 cycles shall not result in an excess of 35% material loss.

#### 2.1.3 Curing Material

"Masterkure 200 W"; "Super Diamond Clear Vox"; 30 percent solids, water based, wax emulsion concrete curing and sealing compound. Material shall meet or exceed moisture retention requirements of ASTM C309, Type 1 liquid membrane forming curing compounds.

2.1.4 Epoxy Bonding Agent

"Anvil Bond"; "Euco #452 MV"; two component, 100% reactive, modified aliphatic amine epoxy resin containing no solvents, fillers, or colorants and formulated to bond cement based floor topping mixes. The bond strength shall be 100 percent of the value at 70°F for temperatures up to 200°F.

2.1.5 Bonding Compound

Pre-packaged, pre-mixed polymer modified bonding slurry formulated for bonding iron armored high performance floor topping to green concrete.

2.1.6 Control Joint Filler

"Masterfill CJ"; "Euco 700"; two component, 100% solids, semi-rigid, epoxy filler manufactured by the floor topping manufacturer for the purpose of filling control joints. Minimum Shore D Hardness shall be 55 in accordance with ASTM D2240.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 General

Surface of the floor shall be screeded and prepared in accordance with the topping manufacturer's written requirements unless otherwise specified. Surfaces shall be free of grease, oil, and other contaminants before further mechanical or chemical preparation.

3.1.2 Concrete Surfaces

3.1.2.1 Curing Period

Not less than 28 days for fully cured concrete, or as specified in Specification Section 03300, "Cast-in-Place Concrete", whichever is greater for topping applied on hardened concrete.

3.1.2.2 Form Release Agents

Form release agents used during the pouring of the concrete shall be removed unless known to be compatible with the topping system selected.

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3.1.2.3 Curing Compounds

Concrete curing compounds shall not be used on the base concrete slab.

3.1.2.4 Contaminants

Oil, grease, and similar deleterious materials shall be removed by scraping off heavy deposits, followed by washing of contaminated areas with detergent and water in accordance with ASTM D4258.

3.1.2.5 Blasting

3.1.2.5.1 Incompatible form oils, surface laitance, cement glaze, and efflorescence shall be removed by abrasive blast cleaning in accordance with ASTM D4259. Abrasive used for blasting shall be a maximum of 20-40 mesh and air pressure shall be reduced to prevent excess removal of concrete and exposure of aggregate. Concrete surfaces shall be blasted to a uniform roughness having a surface texture resembling medium grit sandpaper. Blasting with water injection may be used to eliminate dust. Waterblasting with sand injection may also be used to produce an acceptable surface with no dusting from blasting.

3.1.2.5.2 Waterblasting in accordance with NACE RP0172 with a pressure of 3000 to 5000 psi will effectively remove the surface laitance and contaminants without exposing aggregate.

3.1.2.5.3 Vacuum blasting units may be utilized.

3.1.2.6 Acid Etching

Not allowed.

3.1.2.7 Moisture

Surfaces receiving topping shall be tested for the presence of moisture prior to application of the topping by using the plastic sheet method in accordance with ASTM D4263 unless otherwise specified. Moisture content shall be within limits specified by the manufacturer before application of metallic topping can proceed.

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 General

Application may be over green concrete (Monolithic Application), over fully cured concrete, or over concrete between these two conditions. Application over green concrete is the preferred

method. Application shall be in accordance with the manufacturer's written instructions unless otherwise specified.

### 3.2.2 Environmental conditions

Temperature of materials and substrate shall be in accordance with the manufacturer's written instructions. If the manufacturer has no written instructions, then the material and substrate shall both be between 50°F and 80°F for 24 hours before, during, and after installation unless otherwise specified.

### 3.2.3 Humidity

Humidity shall be measured in the area receiving topping. The humidity shall be within the range specified in the manufacturer's written instructions. If the manufacturer has no written instructions, no material shall be applied when the relative humidity is above 85% or the temperature of the surface is less than 5°F above the dew point unless otherwise specified.

### 3.2.4 Chemical Contamination

If chemical contamination occurs, it shall be removed by washing with water or solvent, and the surface dried before applying the next coat.

### 3.2.5 Monolithic Application

3.2.5.1 At the time of concrete placement, the base slab shall be mechanically scarified (nailraked) to create a mechanical bond for the topping. This step should be undertaken after the first floating of the slab so as to consolidate and densify the slab. Profile in one direction only; do not rake in a "criss-cross" pattern. Do not dislodge or intentionally bury any large aggregate at the surface as this aggregate will aid in the mechanical bond of the topping.

3.2.5.2 Wet cure the slab until topping application.

3.2.5.3 Wait until the surface will support the weight of foot traffic without breaking the nailraked ridges (at least 24 hours) before proceeding with placement of the topping. Topping must be applied within 72 hours after the finish of the concrete placement.

### 3.2.6 Application Over Concrete After 3 Days but Before Fully Cured

3.2.6.1 Prepare base slab as for monolithic application.



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- 3.2.6.2 Upon preparing to apply the bonding compound, closely examine the base slab surface to ensure that the slab is sufficiently set and there is no loose aggregate or debris present which may hinder in the bond of the topping.
- 3.2.6.3 Prepare the bonding compound and brush over the surface of the base slab just prior to the application of the topping. Use a clean, stiff bristle, street broom for application and insure that the bonding compound is brushed into the nailraked grooves and covers the entire damp surface profile.
- 3.2.6.4 If bonding compound dries prior to being covered with topping, do not retemper. Reapply another coat of bonding compound prior to proceeding with topping application.
- 3.2.7 Application Over Fully Cured Concrete
- 3.2.7.1 Prior to preparing the floor for topping application, make a detailed map showing any base cracks or joints that may mirror in the placed topping. Alternatively, permanently seal all major cracks no sooner than 18 hours prior to application of bonding agent. Sealing material shall be as recommended by manufacturer of the topping system.
- 3.2.7.2 Prepared surface soundness shall be tested through the use of an Elkometer, according to procedures specified in ACI 503R, and have a minimum tensile strength of 175 psi.
- 3.2.7.3 Mechanical fasteners will help insure bond and reduce chances of edge curling. Drive 1 3/4 inch concrete nails into concrete at a minimum of 6 inches from joints and 12 inches on centers, staggered.
- 3.2.7.4 Shotblast with proper sized shot, or sandblast to degree in which it can be ascertained that a strong, dense surface is obtained over the entire area to receive topping. Small and medium sized aggregate should be exposed but surface must be moderately rough and not polished.
- 3.2.7.5 Base slab must be clean of all oil, debris, dust, and other foreign matter which may hinder bond. Follow with complete cleaning using compressed air.
- 3.2.7.6 Test surface for hardness with a sharp, tempered nail or knife to assure sound surface. Further test slab for presence of carbonated contaminants with dilute acid or phenolphthaleine.
- 3.2.7.7 Apply bonding agent in a uniform coat with a short nap roller, squeegee, stiff brush, or broom in accordance with the manufacturer's written instructions. Bonding agent must be wet or tacky when topping is applied. If bonding agent becomes hard, a

fresh application of bonding agent shall be applied within 24 hours of the first bond coat; thereafter, the surface must be reabraded.

- 3.2.7.8 Placement of topping over hardened bonding agent will not be permitted as it will result in delamination.

3.2.8 Application Thickness

Minimum thickness of the topping shall be 1 (one) inch. Measurements will be taken prior to topping installation and reported to the Buyer for approval.

3.2.9 Floor Flatness

- 3.2.9.1 Adjacent to embed tubes the topping shall be screeded flush to the top of the embeds. The surface shall be such that there will be no more than a +/- 1/16" deviation from a 24 inch long straightedge placed anywhere on the topping surface.

- 3.2.9.2 The topping on the remainder of the operating floor shall be such that there shall be no more than a 1/8" depression below a 10 foot long straightedge placed anywhere on the surface.

3.2.10 Finish

Hard or burnished trowel finish. Avoid blistering.

3.2.11 Curing

Immediately following final finishing, two coats of membrane forming curing compound shall be applied.

3.2.12 Control Joints

Saw cut control joints as soon as the surface permits the weight of the saw without causing the topping edges to ravel. Spacing of the control joints should mirror the existing construction joints of the base concrete slab. Maximum control joint spacing shall be twenty feet on center in each direction. Fill joints with control joint filler once the topping is fully cured.

- 3.2.13 The sample area described in Part 1 of this specification section may, when approved, be incorporated into the work area.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

Submit cubes (2 inch x 2 inch x 2 inch) of fully cured samples to laboratory for testing to assure that characteristics comply with

minimum requirements specified. Samples shall be cast at time of topping placement. Two samples shall be sent to the laboratory and one sample shall be retained at the site.

### 3.4 ADJUSTMENTS

#### 3.4.1 Repairs

Repair damaged or improperly installed or finished surfaces using the topping materials specified for the original work, in accordance with written recommendations of the topping manufacturer.

### 3.5 CLEANING

The cleaning of surfaces not intended or designated to receive topping system shall be cleaned in accordance with the manufacturer's written instructions.

### 3.6 PROTECTION

#### 3.6.1 Surfaces and Fixtures

Remove, mask, or otherwise protect surfaces and fixtures not intended to receive topping.

#### 3.6.2 Equipment

Protect working parts of mechanical and electrical equipment from damage during surface preparation and topping process.

#### 3.6.3 Drains

Drains shall be plugged during installation of metallic topping to ensure that topping does not enter drainage system. All gratings, if any, shall be removed prior to topping application.

### 3.7 DEMONSTRATION

(Not Used)

### 3.8 SCHEDULES

(Not Used)

END OF SECTION

SECTION 05059  
WELDING - STAINLESS STEEL LINERS  
(B-595-C-B210A-05059)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
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WAPA YES    NO X  
QUALITY LEVEL I    II X  
SAFETY CLASS 1    2    3 X 4   

ORIGINATOR(S):

CHECKER(S):

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SECTION 05059  
WELDING - STAINLESS STEEL LINERS  
(B-595-C-B210A-05059)

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**SECTION 05059**  
**WELDING - STAINLESS STEEL LINERS**

**PART 1 GENERAL**

**1.1 SUMMARY**

This specification section defines the welding, examination and testing requirements for fabrication of stainless steel embeds, carbon steel embeds and stainless steel liner plates.

**1.2 REFERENCES**

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**  
**Boiler and Pressure Vessel Codes**

ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels
ASME Section IX	1989 Welding and Brazing Qualification

**AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)**

ASNT SNT-TC-1A	1988 Recommended Practice - Personnel Qualification and Certification in Nondestructive Testing
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**AMERICAN WELDING SOCIETY (AWS)**

AWS D1.1	1990 Structural Welding Code
AWS D9.1	1990 Sheet Metal Welding Code
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe Without Backing

**1.3 RELATED REQUIREMENTS**

Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
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1.4        **DEFINITIONS**

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5        **SYSTEMS DESCRIPTION**

(Not Used)

1.6        **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1      Welding Procedure Specifications and Procedure Qualification Records shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with the requirements of the AWS D1.1 or ASME Section IX and this specification section. Seller shall review the contractor's procedures to verify their conformance to the requirements of this specification section.

1.6.2      Welder Performance Qualifications shall be submitted for information. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance with AWS D1.1 or ASME Section IX and this specification section.

1.6.3      Certified Material Test Reports (CMTRs) for filler material shall be submitted for Buyer review.

1.6.4      Weld repair procedures shall be submitted for Buyer approval.

1.6.5      Final weld nondestructive examination (NDE) and inspection reports shall be submitted for Buyer review. These shall include visual inspection reports and radiographic film.

1.7        **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8        **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Matching weld filler materials shall be in accordance with AWS D1.1, Table 4.1 or AWS D9.1, Appendix A.
- 2.1.2 For welding carbon steel a minimum 70 ksi weld filler metal shall be used.
- 2.1.3 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal (Example: for stainless steel 304L, use AWS Classification E/ER 308L filler material).
- 2.1.4 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux is not acceptable.
- 2.1.5 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.
- 2.1.6 Submerged arc welding shall be performed using the same name brand flux and the same name brand of AWS classification wire as used for the procedure qualifications.
- 2.1.7 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of AWS D1.1, AWS D9.1 and the filler metal manufacturer's recommendations.
- 2.1.8 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.
- 2.1.9 Temporary backup rings or strips, when required on the Contract Documents, shall be of the same nominal composition as the base material.
- 2.1.10 For dissimilar joints in base materials consisting of carbon steel on one side and austenitic stainless steel on the other, the filler metal shall be AWS Classification E/ER 309L.
- 2.1.11 Use AWS Classification E/ER 309L for all weld passes when joint detail indicates stainless steel liner being welded to carbon steel embed.



## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 General Requirements

2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of AWS D1.1, Section 8.

2.2.1.2 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.

2.2.1.3 All weld spatter, burrs, etc. shall be ground to a smooth contour.

2.2.1.4 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.

2.2.1.5 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the base metal surface. The remaining metal shall then be ground flush with the base metal surface. The ground area shall be inspected for cracks or porosity either by liquid penetrant or magnetic particle examination, whichever is applicable. Liquid penetrant and magnetic particle examination shall be in accordance with Paragraph 3.2.8.

### 2.2.2 Welding Qualifications

2.2.2.1 Welding procedures, welders, welding operators and tackers shall be qualified in accordance with AWS D1.1 or ASME Section IX where applicable. ASME Section IX, Welder Performance Qualification, may be used in lieu of AWS D1.1 qualifications.

2.2.2.2 Qualification of shear stud bases shall be in accordance with AWS D1.1, Section 7.

2.2.2.3 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.

2.2.2.4 The format of welding procedure specifications including prequalified welding procedures, welding procedure qualification records and nondestructive inspection reports shall be in accordance with AWS D1.1, Appendix E or ASME Section IX, Appendix A or equivalent.

2.2.2.5 Welding shall not start until Welding Procedure Specifications, Procedure Qualification Records and Weld Repair Procedure are returned to the Seller from the Buyer with authorization to proceed. Welding performed by procedures differing from those

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authorized or personnel not qualified are subject to complete removal.

## 2.2.3 Acceptable Welding Processes

### 2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

<u>Welding Process</u>	<u>AWS Letter Designation</u>
Shielded Metal Arc Welding	SMAW
Flux-Cored Arc Welding (with shielding gas)	FCAW
Shear Stud Welding	SW
Automatic Submerged Arc Welding	SAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW

### 2.2.3.2 Other welding processes such as Gas Metal Arc or Manual Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.

## PART 3 EXECUTION

### 3.1 PREPARATION

3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting shall not be used for joint preparation of stainless steel.

3.1.2 For structural tubular welds, longitudinal weld seams shall be parallel to the longitudinal axis and shall be complete (100 percent) penetration butt welds. Longitudinal seams of adjoining tubular members shall not be in line but shall be offset from other longitudinal seams by at least five (5) times the wall thickness of the tubular component.

3.1.3 Permanent backup strips or backing rings are not permitted without specific written authorization from the Buyer. Embeds are not considered backup strips. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of area shall be performed visually and by either magnetic particle or liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.8.

- 3.1.4 The parts to be joined shall be in accordance with the assembly requirements of AWS D1.1, Section 3.3.
- 3.1.5 To minimize the contamination of austenitic stainless steel plates, Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.6 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.7 For stainless steel, joint edges and adjacent surfaces to be welded shall be wire brushed. They shall be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.8 Wire brushes used on stainless steel welds shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel only and shall be visible while tool is in use.
- 3.1.9 Grinding shall be done in such a method that overheating of stainless steel base metal and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.
- 3.1.10 For double-wall containment portion of sumps where double-welded butt joints cannot be utilized, the root pass welds shall be made with the GTAW process. Back-purging gas shall be used during welding. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited or the weld joint is filled, whichever is less. Back-purging shall be in accordance with AWS D10.11.
- 3.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.
- 3.2 **INSTALLATION, APPLICATION AND ERECTION**
- 3.2.1 All welds shall be made in accordance both with contract drawings and Seller's fabrication drawings.
- 3.2.2 All plug and butt welds on liner plates shall be ground smooth and flush with the base metal for ease of decontamination.
- 3.2.3 Where the embed joint detail indicates  $2t$  root opening ( $t$  = base metal thickness), the first welds deposited shall be fillet welds fusing the carbon steel embed to the stainless steel liner plates.

- 3.2.4 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be ground to eliminate crater cracks before continuing the weld. The use of starting and stopping plates is recommended where possible.
- 3.2.5 Plug welds and square edge butt joints shall have a minimum of 3 passes when welded to carbon steel embeds.
- 3.2.6 Preheat and Interpass Temperature Control
- 3.2.6.1 The minimum preheat and interpass temperature requirements for carbon steel shall be in accordance with AWS D1.1, Paragraphs 4.2 and 4.3.
- 3.2.6.2 The minimum preheat for stainless steel shall be 50°F. Interpass temperature shall not exceed 350°F.
- 3.2.7 Stress Relief Heat Treatment
- 3.2.7.1 When required by contract documents, welded assemblies shall be stress-relieved by heat treating.
- 3.2.7.2 Stress relief for purposes of dimensional stability is not acceptable for ganged embeds with PUREX nozzles.
- 3.2.7.3 Stress relief heat treatment shall be in accordance with AWS D1.1, Section 4.4. Exception: alternate stress relief times and temperatures permitted by Table 4.5 shall not be used.
- 3.2.7.4 All finish machining required shall be done after heat treatment.
- 3.2.8 Inspection and Nondestructive Examination
- Specific nondestructive examination (NDE) shall be performed in accordance both with contract documents and Seller's fabrication drawings. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.
- 3.2.8.1 Inspection
- A. The welding inspector shall be qualified and certified in accordance with AWS D1.1 Paragraph 6.1.3.
- B. All weld inspection reports shall be submitted in accordance with Paragraph 1.6.

3.2.8.2 Visual Examination

- A. Visual examination shall be performed in accordance with AWS D1.1, Section 6.
- B. Seller shall visually inspect all completed welds in accordance with AWS D1.1, Section 8.15.1. Weld profiles shall be in accordance with Figure 3.4 of AWS D1.1. Defective welds shall be repaired in accordance with Seller's approved weld repair procedures.
- C. In addition to visual examination of the completed weld, visual examination is required for all ground and blended welds.
- D. For butt joints, the weld metal on the front surface shall in no place be lower than the adjacent base metal surfaces.
- E. Plug and groove welds shall have a uniform transition from the joined material into the weld deposit. They shall be free of undercut and unfused overlap of the weld deposit.
- F. Fillet weld surfaces shall have a uniform transition from the base material into the weld deposit. They shall be free of undercut and unfused overlap.

3.2.8.3 Liquid Penetrant Examination (Structural Steel Embeds)

Liquid penetrant examination shall be in accordance with AWS D1.1, Section 6.7.7, when required by the contract documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.5.

3.2.8.4 Liquid Penetrant Examination (Austenitic Stainless Steel Liner Plates)

- A. Liquid penetrant examination shall be in accordance with ASME Section V, Article 6 when required by the contract documents. Acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4. Exception: maximum round indication shall not exceed 1/16 inch.
- B. Liquid penetrant examination shall be performed after welds have been ground and visually examined. Examination shall include a band of base metal no less than 1 inch on each side of the weld.
- C. Penetrant material shall be in accordance with the requirements of T-625 of Article 6, ASME Section V for sulfur and halogen content.

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3.2.8.5 Magnetic Particle Examination

Magnetic particle examination shall be in accordance with AWS D1.1, Section 6.7.6, when required by the contract documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.5.

3.2.8.6 Ultrasonic Examination

Ultrasonic examination shall be in accordance with AWS D1.1, Chapter 6, Part C, when required by the contract documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.4.

3.2.8.7 Leak Testing

- A. When required by the contract documents, the helium mass spectrometer test detector probe technique method shall be performed in accordance with ASME Section V, Article 10, Appendix IV. Acceptance criteria shall be in accordance with Paragraph IV-1050. The maximum helium gas pressure shall not exceed 5 psig.
- B. When required by the contract documents, the vacuum box test method shall be performed in accordance with ASME Section V, Article 10, Appendix II. Acceptance criteria shall be in accordance with Paragraph II-1050.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

- 3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedures.
- 3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined either by the magnetic particle or liquid penetrant method to assure complete removal of defects. Magnetic particle or liquid penetrant examination shall be in accordance with Paragraph 3.2.8.
- 3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

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3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of the Buyer.

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

SECTION 05062  
WELDING PIPING  
(B-595-C-B210A-05062)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
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WAPA YES X NO      
QUALITY LEVEL I X II      
SAFETY CLASS 1     2     3 X 4    

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11-12-92  
Date

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SECTION 05062  
WELDING PIPING  
(B-595-C-B210A-05062)

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**ATTACHMENTS**

<u>ATTACHMENTS</u>	<u>TITLE</u>	<u>REV. NO.</u>
A	SUMMARY OF HEAT TREATMENT, NDE AND RELATED REQUIREMENTS FOR WELDED PIPING	0

## SECTION 05062 WELDING PIPING

### PART 1 GENERAL

#### 1.1 SUMMARY

This specification section defines the welding, thermal treatment, examination and testing requirements for stainless steel and nickel alloy piping.

#### 1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

##### AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3                      1990 Chemical Plant and Petroleum  
Refinery Piping

##### Boiler and Pressure Vessel Code

ASME Section II,              1989 Material Specifications -  
Part C                          Welding Rods, Electrodes, and  
Filler Metals

ASME Section V              1989 Nondestructive Examination

ASME Section VIII,        1989 Rules For Construction of  
Division 1                   Pressure Vessels

ASME Section IX            1989 Welding and Brazing  
Qualification

##### AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A            1988 Recommended Practice -  
Personnel Qualification and  
Certification in Nondestructive  
Testing

##### AMERICAN WELDING SOCIETY (AWS)

AWS A2.4                    1986 Standard Symbols for Welding,  
Brazing and Nondestructive  
Examination

AWS A3.0	1989 Welding Terms and Definitions Including Terms for Brazing, Soldering, Thermal Spraying and Thermal Cutting
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe without Backing
AWS QC1	1988 Standard and Guide for Qualification and Certification of Welding Inspectors

1.3 RELATED REQUIREMENTS

Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 15060	Piping Material, Fabrication, Erection and Pressure Testing (Alloy Piping)

1.4 DEFINITIONS

CMTR - Certified Material Test Report  
NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent) and Procedure Qualification Records (ASME Form QW-483 or equivalent) shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with ASME Section IX and this specification section. Seller shall review the contractor's procedures to verify their conformance to the requirements of this specification section.
- 1.6.2 Welder Performance Qualifications (ASME form QW-484 or equivalent) shall be submitted for Buyer review. This requirement shall also pertain to purchased items contracted by Seller.

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- 1.6.3 Weld repair procedures shall be submitted for Buyer approval.
- 1.6.4 Final weld nondestructive examination (NDE) and inspection reports shall be submitted for Buyer review. These shall include visual inspection reports and radiographic film.
- 1.6.5 Attachment A (Form E-651) summarizing application of individual welding procedures with regards to types of joints and piping material line classes shall be submitted for Buyer approval. Welding shall not begin until these documents are returned to Seller with authorization to proceed.
- 1.6.6 Certified Material Test Reports (CMTRs) for filler material shall be submitted for Buyer review.
- 1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**  
(Not Used)
- 1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**  
(Not Used)

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.
- 2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.
- 2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux is not acceptable.
- 2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.
- 2.1.5 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendations. At minimum, nickel alloy-covered electrode shall be stored in an electrode

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### 2.2.3 Acceptable Welding Processes

2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

<u>Welding Process</u>	<u>AWS Letter Designation</u>
Shielded Metal Arc Welding	SMAW
Manual and Automatic Gas Tungsten Arc Welding	GTAW
Automatic Submerged Arc Welding	SAW

2.2.3.2 Other welding processes such as Gas Metal Arc or Manual Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.

2.2.3.3 SAW welding process shall not be used on nickel alloy.

## PART 3 EXECUTION

### 3.1 PREPARATION

3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel thermal cutting shall not be used for joint preparation of stainless steel and nickel alloys.

3.1.2 Permanent backup strips or backing rings are not permitted without specific written authorization from Buyer. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the area shall be performed both visually and by liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.4.

3.1.3 Where specific details of fabrication are not shown on the contract documents, fabrication shall be in accordance with ASME B31.3.

3.1.4 A template shall be used to lay out headers, laterals and other irregular details. This is to ensure accurate cutting and a proper fit-up.

3.1.5 When branch reinforcement is required, it shall be shown on design drawings. Welding shall be in accordance with ASME B31.3.

- 2.2.1.8 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the pipe surface. The remaining material shall then be ground flush with the base metal. Grinding shall not reduce the pipe wall thickness below 0.875 times the nominal wall thickness. The ground area shall be inspected for cracks or porosity by liquid penetrant or magnetic particle examination, whichever is applicable. Liquid penetrant and magnetic particle examination shall be in accordance with Paragraph 3.2.4.
- 2.2.1.9 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.
- 2.2.1.10 Attachment A of this specification section summarizes heat treatment, ASME jurisdiction, inspection and nondestructive examination requirements for shop and field welds.
- 2.2.1.11 All butt joint welds shall be full penetration. This includes secondary containment portion of double jacketed piping.
- 2.2.1.12 Piping root pass welds shall be made by the GTAW process with filler metal added. Fill passes and cap pass welds can be deposited by any of the processes listed in Paragraph 2.2.3. The root pass on said welds shall be made with back-purging gas. The purge shall be maintained until not less than .250 inch of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.
- 2.2.1.13 GTAW process for circumferential butt joint welds without filler metal (autogenous welding) may be acceptable provided the Seller submits all pertinent technical information and receives authorization. Welds shall be made using an automatic orbital welder.
- 2.2.2 Welding Qualifications
- 2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder Performance Qualifications shall be in accordance with ASME Section IX. They shall also be in accordance with the requirements of this specification section.
- 2.2.2.2 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.
- 2.2.2.3 When consumable inserts are used for stainless steel and nickel alloy butt joints, the welding procedure must be qualified with an insert.

oven before use. Oven temperature shall be between 200°F and 300°F, inclusive.

- 2.1.6 Submerged arc welding shall be performed using both the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.
- 2.1.7 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.
- 2.1.8 A minimum of 2 passes are required on all socket weld connections.
- 2.1.9 For dissimilar joints in base material consisting of carbon steel on one side and nickel-chrome on the other, the filler metal shall meet the requirements of ASME classifications ENiCrFe-3 and ENiCr-3. When the base material is carbon steel on one side and austenitic stainless steel on the other, the filler metal shall be ASME classification E/ER 309L. Joints of this nature must be avoided wherever practical.

## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 General Requirements

- 2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME B31.3. Conformance to this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.
- 2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.
- 2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.
- 2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.
- 2.2.1.5 Peening of welds is not permitted.
- 2.2.1.6 All weld spatter, burrs, etc. shall be removed/ground out in their entirety and blended smoothly with the pipe surface.
- 2.2.1.7 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.

- 3.1.6 To minimize the contamination of stainless steel and nickel alloy, Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.7 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.8 Joint edges and adjacent surfaces to be welded shall be wire brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.9 Wire brushes shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel and nickel alloys such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel and nickel alloys only. Marking shall be visible while tool is in use.
- 3.1.10 Grinding shall be done in such a method that overheating of stainless steel base metal and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.
- 3.1.11 For nickel alloy, an area one inch wide minimum on each side of the weld joint shall be ground to bright metal prior to welding. An 80 grit abrasive wheel shall be used to perform this grinding.
- 3.1.12 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.
- 3.2 **INSTALLATION, APPLICATION and ERECTION**
- 3.2.1 All welds shall be made in accordance both with contract documents and Seller's fabrication drawings.
- 3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.
- 3.2.3 Thermal Treatment
- 3.2.3.1 Minimum mandatory preheating temperatures for thermal cutting, tack welding and welding shall be in accordance both with ASME B31.3, Table 330.1.1 and Attachment A. The minimum preheat temperature shall be sufficient to remove all moisture prior to welding.
- 3.2.3.2 Interpass temperature for stainless steel shall not exceed 350°F.
- 3.2.3.3 Interpass temperature for nickel alloy shall not exceed 200°F.



### 3.2.4 Inspection and Nondestructive Examination

#### 3.2.4.1 General Requirement

Specific nondestructive examination (NDE) requirements for each material and piping line class shall be as noted in Attachment A. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

- A. Buyer may witness any or all examinations with final authority on all NDE interpretation results.

#### 3.2.4.2 Inspection

- A. Seller's welding inspector shall be qualified and certified in accordance with AWS QC1 or equal that has been authorized by Buyer.
- B. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.

#### 3.2.4.3 Visual Examination

- A. Visual examination shall be performed in accordance both with ASME B31.3, Paragraph 344.2 and this specification section.
- B. Visual examination shall be performed on accessible surface of all completed welds.
- C. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

#### 3.2.4.4 Liquid Penetrant Examination

- A. Liquid penetrant examination shall be in accordance with ASME Section V, Article 6. Solvent-removable penetrant shall be used.
- B. Penetrant materials shall be in accordance with ASME Section V, Article 6, Paragraph T-625 for sulfur and halogen content regardless of the type of material to be examined.
- C. Liquid penetrant examination of welds shall include a band of base metal no less than 1 inch wide on each side of the weld.
- D. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

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3.2.4.5 Ultrasonic Examination

- A. Ultrasonic examination procedures shall be in accordance both with ASME Section V, Article 5 and ASME B31.3, Paragraph 344.6.2.
- B. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 344.6.2.

3.2.4.6 Radiographic Examination

- A. Radiographic examination procedures and techniques shall be in accordance with ASME B31.3, Paragraph 344.5.
- B. The acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2 and Table 341.3.2A, as applicable.

3.2.5 Charpy Impact Testing

3.2.5.1 Procedure Qualification Record (PQR)

- A. Testing is only required when welding PUREX remote connector nozzles to stainless steel and nickel alloy piping.
- B. Deposited weld metal and both heat affected zones shall be tested with results recorded on the PQR.
- C. Testing shall be in accordance with ASME Section VIII, Paragraph UG-84.
- D. The minimum impact energy shall be 18 ft. lbs. at room temperature.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

3.4.1.2 Unacceptable indications shall be completely removed by chipping gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined either by the liquid penetrant method to assure complete removal of defects. Liquid penetrant methods shall be in accordance with Paragraph 3.2.4.

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3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

ATTACHMENT A

FORM E-651

GENERAL REQUIREMENTS

SUMMARY OF HEAT TREATMENT, NDE AND RELATED  
REQUIREMENTS FOR WELDED PIPING

- 1a. For stainless steel: Preheat base metal to 50°F for all thicknesses. Maximum interpass temperature shall not exceed 350°F
- 1b. For nickel alloy: Preheat base metal to 50°F for all thicknesses. Maximum interpass temperature shall not exceed 200°F
- 2a. 100% of circumferential butt joint welds on internal process lines shall be radiographed. 5% of circumferential butt joint welds and 5% of split containment fittings on jacketing shall be random radiographed. Acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2 and Table 341.3.2A, for Normal Fluid Service.
- 2b. 100% of circumferential butt joint welds shall be radiographed. Acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2 and Table 341.3.2A, for Normal Fluid Service. As an exception to radiography for Piping Material Class "A", radiography will not be required for electrical penetrations. Electrical penetration can be identified by Specification Section 15060, Piping Material Class "A", Note 3.
- 3a. 100% visual examination of butt welds shall be performed in accordance both with this specification section and ASME B31.3, Paragraph 341.4.1.

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Client: DEPARTMENT OF ENERGY  
 Plant: INLAND WASTE VITRIFICATION PLANT  
 Location: RICHLAND, WASHINGTON

**SUMMARY OF HEAT TREATMENT, NDE AND RELATED  
 REQUIREMENTS FOR WELDED PIPING  
 FLUOR DANIEL E-651 FORM**

Contract: 845734  
 Piping Material Engineer: C. INANO  
 Welding Engineer: A. ESTRADA

R E V I S I O N	L I N E C L A S S	C A T E G O R Y • D O R M	Pipe Material And P-Number	Non-Pressure Attachment Material And P-Number	HEAT TREATMENT				DESTRUCTIVE AND NON-DESTRUCTIVE EXAMINATION						NOTES	WELDING PROCEDURE SPECIFICATION(S)
					B U T T A N D W E L D S	F I L L E T W E L D S	S O L D E T W E L D S	S E A L W E L D S	N O N P R E H E M E N T S	B E N D S	R A D I O G R A P H Y (RT)	U L T R A S O N I C (UT)	M P A A G R A N T E I T C I L C (MT)	L P I E Q U E I T D R A N T (PT)	B H R I N D E N S (BHN)	V I S U A L (VT)
	A		304L SS P-8	304L SS P-8	1a	1a	1a	--	2b	--	--	--	--	100%, 3a	ASME B31.3	
	A3		304L SS P-8	304L SS P-8	1a	1a	1a	--	2b	--	--	--	--	100%, 3a	ASME B31.3	
	DD		304L SS P-8	304L SS P-8	1a	1a	1a	--	2a	--	--	--	--	100%, 3a	ASME B31.3	
	DE		316L SS P-8	316L SS P-8	1a	1a	1a	--	2a	--	--	--	--	100%, 3a	ASME B31.3	
	K		C-22 P-45	C-22 P-45	1b	1b	1b	--	2b	--	--	--	--	100%, 3a	ASME B31.3	

\*Blank Denotes Basic Code Requirements

SECTION 05123  
MISCELLANEOUS METALS  
(B-595-C-B210A-05123)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA YES      NO X  
QUALITY LEVEL I      II X  
SAFETY CLASS 1      2      3 X 4     

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R. P. Kumar

11/11/92  
Lead Discipline Engineer

NOV 16 1992

SECTION 05123  
MISCELLANEOUS METALS

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## SECTION 05123 MISCELLANEOUS METALS

### PART 1 GENERAL

#### 1.1 SUMMARY

This section covers the technical requirements for the furnishing, fabrication, delivery, installation and inspection of miscellaneous carbon and stainless steel embedded into concrete.

#### 1.2 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designation only.

##### AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S302                      1986 Code of Standard Practice for Steel Buildings and Bridges

##### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M              1990 Standard Specification for Structural Steel

ASTM A53                      1990 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A108                    1990 Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality

ASTM A240                    1991 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

ASTM A276                    1990 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

ASTM A312/A312M            1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes

ASTM A480/A480M            1991 General Requirements for Flat-Rolled Stainless Heat-Resisting Steel Plate, Sheet and Strip



ASTM A484/A484M 1991 Standard Test Methods for General Requirements for Stainless and Heat-Resisting Bars, Billets and Forgings

ASTM A496 1990 (Rev. A) Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

### 1.3 RELATED REQUIREMENTS

Specification Section 05059 Welding - Stainless Steel Liners

Specification Section 09875 Priming of Steel

Specification Section 13252 Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

### 1.4 DEFINITIONS

1.4.1 The integral method of liner plate installation utilizes the liner plate as permanent forms for concrete placement.

1.4.2 The wallpaper method of liner plate installation utilizes embeds in previously placed concrete to fasten the liner plate.

1.4.3 A containment boundary weld is a weld located such that in the final installation, it will be exposed to the room interior.

### 1.5 SYSTEM DESCRIPTION

(Not Used)

### 1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certified Material Test Reports (CMTRs) demonstrating material conformance to all the noted ASTM and AWS requirements identified in Paragraph 2.1.

1.6.2 Sample of stainless steel plate for liner for acceptance of finish specified in Paragraph 2.1.2.1.

1.6.3 Shop and erection drawings meeting the requirements of Paragraph 2.2.1.1.

1.6.4 Documentation of quality control and inspection procedures in accordance with Paragraph 3.3.1.

1.6.5 Records of certification and test reports in accordance with Paragraph 3.3.1.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

**PART 2 PRODUCTS**

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Carbon Steel Materials

2.1.1.1 Structural steel members (shapes, bars, and plate): ASTM A36.

2.1.1.2 Pipe: ASTM A53, Type E or Type S, Grade B.

2.1.1.3 Welded studs: Nelson Type S3L or H4L or equal conforming to ASTM A108 Grades C-1010 through C-1020 (low carbon cold drawn steel), with a minimum ultimate tensile stress capacity of 55,000 psi, or Nelson Type D2L or equal conforming to ASTM A496 with a minimum ultimate tensile stress capacity of 80,000 psi.

2.1.1.4 Floor plates: Floor plate shall be skid resistant raised pattern carbon steel plate, 1/4 inch thick excluding the height of the raised pattern. The plate material shall have a minimum yield stress of 33000 psi.

2.1.1.5 Paint and coatings: Specification Section 09875, Priming of Steel.

2.1.1.6 Weld materials: Specification Section 05059, Welding-Stainless Steel Liners. Low hydrogen welding electrodes with a tensile strength of 70,000 psi. Electrodes shall be compatible with the welding process and materials being welded.

2.1.2 Stainless Steel Materials

2.1.2.1 Plate: ASTM A240, Type 304L; hot rolled, solution annealed, surface cleaned and polished to a No. 4 finish in accordance with ASTM A480/A480M on exposed side of plate.

2.1.2.2 Bars and Shapes: ASTM A276, Type 304L ( $F_y = 25$  ksi); hot finished, condition A for bars; hot finished, Class A or C in accordance with ASTM A484/A484M for shapes.

2.1.2.3 Pipe: ASTM A312, Grade TP304L; seamless.

2.1.2.4 Weld materials: Specification Section 05059, Welding - Stainless Steel Liners. For welding stainless steel to stainless steel use E/ER 308L electrodes with a tensile strength of 75,000 psi. For welding carbon steel to stainless use E/ER 309L with a tensile strength of 75,000 psi.

## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 Shop Detailing

2.2.1.1 Prepare and submit shop and erection drawings for Buyer's approval. Include dimensioning, fabrication and erection details, connection details, methods of field assembly, mark numbers and bills of material. Clearly note field bolting and welding requirements.

2.2.1.2 Each item detailed shall be provided with a unique identifier (mark number) which identifies the structure or building number, the fabricators detail sheet number and an individual piece designation number. Clearly show piece mark numbers on erection drawings.

2.2.1.3 Cut or raw edges shall be rounded off and smooth to the touch.

2.2.1.4 Bends shall have a minimum radius equal to the thickness of the material.

### 2.2.2 Shop Fabrication - Carbon Steel

2.2.2.1 Do not begin shop fabrication until the shop and erection drawings have been reviewed and released for fabrication by the Buyer.

2.2.2.2 Fabrication of structural steel shall be in accordance with the requirements of the AISC (S302), Sections 6.1 through 6.6, with the modifications and additional requirements specified hereinafter.

2.2.2.3 All fabricated steel shall be indelibly marked with the mark number shown on the shop drawings.

2.2.2.4 Shop welding, including welding qualification, process and preparation, shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners, as applicable for carbon steel. Only visual examination of welds, in accordance with procedures specified in Specification Section 05059, is required unless noted otherwise on the Contract Drawings.

2.2.2.5 Steel shall be primed in accordance with Specification Section 09875, Priming of Steel.

- 2.2.2.6 Prior to priming, all sharp corners, burrs (including bolt hole burrs), weld spatter, slag, weld flux, loose mill scale and other foreign matter shall be removed.
- 2.2.3 Shop Fabrication - Stainless Steel
- 2.2.3.1 Precautions shall be taken to prevent scratching, abrading, nicking and denting during fabrication and handling. Maintain the original surface finish during fabrication, or restore following fabrication to a quality equal to the original finish.
- 2.2.3.2 The requirements of Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys, shall be followed for handling, fabrication, shipment and storage techniques to minimize the risk of contamination of stainless steel.
- 2.2.3.3 Do not coat stainless steel materials.
- 2.2.3.4 Make erection marks on fabricated liner plate with vegetable dyes or vibroetching. Painting, chemical etching and die stamping are not acceptable.
- 2.2.3.5 Shop welding, including welding qualification, process and preparation, shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners.
- 2.2.3.6 The stainless steel liner for walls may be installed by the integral method or wallpaper method at the option of the Seller.
- 2.2.3.7 Determine the extent of shop fabrication and the size of shipping pieces within the requirements indicated in the Contract Drawings.
- 2.2.3.8 Join liner plate into shipping pieces with complete joint penetration groove welds and clearly note on the shop and erection drawings. Welds shall be ground flush with the plate to a 250-micron finish.
- 2.2.3.9 Fabricated liner plate shall be free from warp or twist in excess of 1/4 inch in 10 feet. Inspect fabricated liner plate to verify tolerances.
- 2.2.3.10 Nondestructive examination (NDE) methods and acceptance criteria of welds and weld repairs shall be performed in accordance with Specification Section 05059, Welding-Stainless Steel Liners, as required below:
- A. Liquid penetrant examination shall be performed on cap pass of complete joint penetration groove welds joining liner plate into shipping pieces. Testing shall be performed after all grinding is complete.

- B. Leak testing (helium mass spectrometer test method) shall be performed on welds which are part of the double containment portion of stainless steel sumps.

2.2.4 Shipping

- 2.2.4.1 Shipping lists shall accompany each shipment of steel.
- 2.2.4.2 Cars and/or trucks shall be loaded and cribbed so they can be readily unloaded. The steel shall be protected from damage caused by shifting of steel during transit.
- 2.2.4.3 The sizes of fabricated pieces shall be as large as practicable considering clearances and capacities of railroad cars or trucks between the fabricating shop and the jobsite.
- 2.2.4.4 Small pieces shall be bundled with steel bands to prevent damage during shipment and to facilitate unloading.

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Prior to beginning field erection, the Seller shall review the erection drawings, verify receipt of all required materials, and develop an erection plan. The erection plan shall take into account erection loads and provide sufficient temporary bracing to maintain the steel in a safe condition. The temporary bracing shall maintain the steel in a plumb and correctly aligned condition until erection has been completed.
- 3.1.2 Store structural steel members, insert plates and liner plates in an area designated by the Buyer, aboveground on platforms, skids or other supports, in such manner that any deformation or damage of shapes, plates, etc., shall be avoided.
- 3.1.3 The requirements of Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys, shall be followed for handling, storage and erection techniques to minimize the risk of contamination of stainless steel.

3.2 INSTALLATION, APPLICATION AND ERECTION

Erect structural steel in accordance with the requirements of the AISC S302, Section 7, with the modifications and additional requirements specified herein.

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- 3.2.1 Immediately report to the Buyer errors in shop work or errors in existing conditions that are discovered in the field. Do not take corrective action without approval by the Buyer.
- 3.2.2 Field weld components as indicated on the erection drawings. Field weld welded studs in accordance with manufacturer's instructions.
- 3.2.3 All field welding shall be performed in accordance with Specification Section 05059, Welding - Stainless Steel Liners. Welds on the stainless steel liner shall be ground flush with the plate to a 250-micron finish. Only visual examination of welds, in accordance with procedures specified in Specification Section 05059 is required unless otherwise noted on the Contract Drawings.
- 3.2.4 After erection, inspection and acceptance, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete in accordance with Specification Section 09875, Priming of Steel.
- 3.2.5 Seal weld and grind flush all nail holes in embed plates.
- 3.2.6 General erection tolerances shall be in accordance with AISC S302, Section 7.11 and as indicated on the Contract Drawings.
- 3.2.7 After erection, liner plates shall satisfy a flatness tolerance of 1/4 inch in 10 feet.
- 3.2.8 After erection, inspection and acceptance of the stainless steel liner, the stainless steel surfaces (including sumps, trenches and curbs), shall satisfy the limits for contamination in Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys.
- 3.3 **FIELD QUALITY CONTROL**
- 3.3.1 The Seller shall develop quality control program and inspection procedures for the fabrication and erection of the structural steel, insert plates and liner plates to assure conformance with the contract requirements. The Seller's quality control program and inspection procedures shall be submitted in writing to the Buyer for review. Personnel shall be certified to perform inspection activities. Records of certifications, inspection and certified reports of tests required shall be submitted to the Buyer. The Buyer shall be allowed complete access during fabrication and erection and shall be allowed to inspect all operations including welding and testing.

Rev. 0

3.3.2 Nondestructive examination (NDE) methods and acceptance criteria of welds and weld repairs shall be performed in accordance with Specification Section 05059, Welding-Stainless Steel Liners, as required below:

3.3.2.1 Liquid penetrant examination shall be performed on all cap pass field welds joining stainless steel liner plates. Testing shall be performed after all grinding is complete.

3.3.2.2 Final leak testing (vacuum box test method) shall be performed on all shop and field welds of the installed stainless steel liner system. Any weld areas detected to be leaking shall be corrected and retested.

### 3.4 ADJUSTMENTS

(Not Used)

### 3.5 CLEANING

(Not Used)

### 3.6 PROTECTION

All stainless steel liner plate shall be protected after installation from exposure to sunlight by covering with canvas, tarpaulin, plywood or 5-ply PVC film and nylon yarn laminate, such as Griffolyn T-95FR or equal. Liner shall also be protected from any damage during installation and subsequent work in the lined rooms/areas.

### 3.7 DEMONSTRATION

(Not Used)

### 3.8 SCHEDULES

(Not Used)

END OF SECTION

SECTION 05560  
EMBEDDED WALL PENETRATIONS  
(B-595-C-B210A-05560)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA YES      NO X  
QUALITY LEVEL I      II X  
SAFETY CLASS 1      2      3 X 4     

ORIGINATOR:

CHECKER:

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L. S. Davis, Mechanical Engineer Date

D. A. Buzzelli 11-12-92  
D. A. Buzzelli, Lead Disc Checker Date

APPROVED BY:

R. B. Erickson  
C. J. Divona Lead Discipline Engineer

11-12-92  
Date

NOV 16 1992



SECTION 05560  
EMBEDDED WALL PENETRATIONS  
(B-595-C-B210A-05560)

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ATTACHMENTS

<u>ATTACHMENTS</u>	<u>TITLE</u>	<u>REV. NO.</u>
A	LIST OF CONTRACT DRAWINGS	0

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## 1.1 SUMMARY

## 1.2 REFERENCES

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.5M 1982 Dimensioning and Tolerancing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M 1991 Standard Specification for Structural Steel

ASTM A53 1990 Standard Specification for  
Pipe, Steel, Black and Hot-  
Dipped Zinc-Coated Welded and  
Seamless

ASTM A182/A182M 1991 Standard Specification for Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

ASTM A240 1991 (Rev. A) Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

ASTM A276 1990 (Rev. A) Standard  
Specification for Stainless and  
Heat-Resisting Steel Bars and  
Shapes

ASTM A312/A312M

1991 (Rev. B) Standard  
Specification for Seamless and  
Welded Austenitic Stainless  
Steel Pipe

ASTM A530/A530M

1991 (Rev. A) Standard  
Specification for General  
Requirements for Specialized  
Carbon and Alloy Steel Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3

1990 (Addendum a and b)  
Chemical Plant and Petroleum  
Refinery Piping

1.3 RELATED REQUIREMENTS

Specification Section 05059

Welding - Stainless Steel  
Liners

Specification Section 05062

Welding - Piping

Specification Section 05123

Miscellaneous Metals

Specification Section 13252

Precautions for Fabrication,  
Handling and Storage of  
Stainless Steel and Nickel  
Alloys

Specification Section 15196

Identification and Tagging  
Methods For Mechanical  
Equipment

CONTRACT DRAWINGS

Drawings as listed in Attachment A.

1.4 DEFINITIONS

CMTR - Certified Material Test Report

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data  
Requirements section of the Order/Subcontract.

- 1.6.1 Material verification in accordance with Paragraph 2.1.2. Certified Material Test Reports (CMTRs) shall be submitted for Buyer review.
- 1.6.2 Shop drawings shall be submitted for Buyer approval in accordance with Paragraph 2.2.1.
- 1.6.3 Verification of proof testing in accordance with Paragraph 2.2.5.C. Inspection reports shall be submitted for Buyer review.
- 1.6.4 As-built weight for each assembly.
- 1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**  
(Not Used)
- 1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**  
(Not Used)

## **PART 2 PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- 2.1.1 Embedded wall penetrations shall be provided. These penetrations shall be fabricated in accordance with the corresponding drawing listed in Attachment A.
- 2.1.2 Except as noted, embedded wall penetrations shall be Type 304L stainless steel in accordance either with ASTM A182/A182M, ASTM A240, ASTM A276 or ASTM A312/A312M as applicable. Wall plates for H-2-120037 and H-2-120061 shall be in accordance with ASTM A36/A36M. Tube for H-2-120061 shall be Grade B in accordance with ASTM A53. Seller shall verify that materials are in accordance with these standards.
- 2.1.3 The exposed cell side of all stainless steel embedment plates shall be finished in accordance with Specification Section 05123.
- 2.1.4 Stainless steel shall be protected during storage and fabrication in accordance with Specification Section 13252.

### **2.2 FABRICATION AND MANUFACTURE**

- 2.2.1 Seller shall prepare shop fabrication drawings. These drawings shall be in accordance both with the equipment requirement drawings and this specification section. Dimensioning and tolerancing shall be in accordance with ANSI Y14.5M. All shop drawings shall be submitted for Buyer approval before fabrication begins.

- 2.2.2 All welding shall be performed in accordance either with Specification Section 05059 or Specification Section 05062. Welds shall be ground smooth and blended in with the base metal as shown on drawings.
- 2.2.3 Specific weld requirements shall be shown on the Seller's shop fabrication drawings.
- 2.2.4 All welds shall be visually inspected in accordance either with Specification Section 05059 or Specification Section 05062.
- 2.2.4.1 All embed plate penetrations shall be seal welded on the cell side as shown on drawings. Welds shall be liquid penetrant examined in accordance either with Specification Section 05059 or Specification Section 05062.
- 2.2.5 Special Requirements - Item H-2-120060-010.
- A. Bending radius shall be not less than 24 inches. Pipe section at all locations shall be in accordance with ASTM A530/A530M. Bends shall be free of wrinkles and flat spots.
  - B. Pipe couplings shall only be used where necessary. These couplings shall be modified socket weld couplings. Couplings shall not be installed on any pipe bend. One end of each pipe shall have a coupling welded to it.
  - C. Seller shall pressure test every pipe weld in accordance with ASME B31.3. The test pressure shall be 20 psig. All piping shall allow passage of the test rabbit without interference.

## 2.3 CLEANING

All embedded penetration components shall be thoroughly cleaned. All water, sand, grit, weld spatter, grease, oil and other foreign materials shall be removed before shipment preparation begins. Equipment shall be delivered in a clean, rust-free condition.

## 2.4 LABELING

Labeling and identification shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 10.

## 2.5 PACKAGING

Packaging and preparation for shipment shall be in accordance with Seller's standard packaging procedure. At minimum, packaging shall provide protection against corrosion and damage from normal handling and storage in an unheated warehouse.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

(Not Used)

#### **3.2 INSTALLATION, APPLICATION and ERECTION**

##### **3.2.1 Special Requirements - Item H-2-120060-010.**

- A. After erection and pipe welding, Seller shall pressure test every pipe weld in accordance with ASME B31.3. The test pressure shall be 20 psig. Test shall be performed before concrete is poured. All couplings shall be X-rayed to verify gap between pipe and coupling shoulder.

#### **3.3 SHOP QUALITY CONTROL**

(Not Used)

#### **3.4 ADJUSTMENTS**

(Not Used)

#### **3.5 CLEANING**

##### **3.5.1 Special Requirements - Item H-2-120060-010.**

- A. All embedded tube penetration components shall be thoroughly cleaned after pressure tests are completed. All water, sand, grit, weld spatter, grease, oil and other foreign materials shall be removed.

#### **3.6 PROTECTION**

(Not Used)

#### **3.7 DEMONSTRATION**

##### **3.7.1 Special Requirements - Item H-2-120060-010.**

- A. Seller shall demonstrate that the test rabbit can pass through the entire assembly without interference. This test shall be performed after cleaning is completed. Pressure of the compressed air used for this test shall not exceed 5 psig.

#### **3.8 SCHEDULES**

(Not Used)

**END OF SECTION**

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ATTACHMENT A  
LIST OF CONTRACT DRAWINGS

DRAWING NUMBER	DRAWING TITLE
H-2-120002	Mech. Vit. Bldg. Embedded Tube MSM Bag Type Assembly
H-2-120037	Mech. Vit. Bldg. Embedded Tube Plug Delivery System Assembly
H-2-120060	Mech. Vit. Bldg. Embedded Piping Sampling Rabbit System Assembly
H-2-120061	Mech. Vit. Bldg. Embedded Tube Smear Test Exit Tunnel Assembly
H-2-120073	Mech. Vit. Bldg. MC-ICC Elec. Connectors Inner Canister Closure Assembly
H-2-120141	Mech. Vit. Bldg. Embedded Tube Crane Retrieval System Smear Test Exit Tnl
H-2-120241	Mech. Vit. Bldg. MC/CDC Transfer Tunnel Sump Process Connector Assembly
H-2-120244	Mech. Vit. Bldg. MC/CDC Transfer Tunnel Hot Water Process Connector Assembly
H-2-120245	Mech. Vit. Bldg. MC-ICC Process Connections Inner Canister Closure Assembly
H-2-120247	Mech. Vit. Bldg. MC/CDC Transfer Tunnel Spare Hot Water Connector Assembly

SECTION 07160  
BITUMINOUS DAMPPROOFING  
(B-595-C-B210A-07160)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-12-92

WAPA YES      NO X  
QUALITY LEVEL I      II X  
SAFETY CLASS 1      2      3 X 4     

ORIGINATOR:

CHECKER:

*P. von Kronburg* 11/10/92  
P. von Kronburg, Architect Date

*J. L. Datte* 11/11/92  
J. L. Datte, Architectural Lead Date

APPROVED BY:

*J. L. Datte*  
J. L. Datte Lead Discipline Engineer

11/11/92  
Date

NOV 16 1992



SECTION 07160  
BITUMINOUS DAMPPROOFING  
(B-595-C-B210A-07160)

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**SECTION 07160  
BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section covers technical requirements for the preparation of below-grade concrete exterior surfaces and the furnishing and installation of bituminous dampproofing protection.

**1.2 REFERENCES**

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM C208	1972 Standard Specification for Insulating Board (Cellulosic Fiber), Structural and Decorative
ASTM D41	1985 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D140	1988 Standard Practice for Sampling Bituminous Materials
ASTM D449	1989 Standard Specification for Asphalt Used in Dampproofing and Waterproofing
ASTM D4263	1983 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

**1.3 RELATED REQUIREMENTS**

Specification Section 03300 Cast-in-Place Concrete

**1.4 DEFINITIONS**

(Not Used)

**1.5 SYSTEM DESCRIPTION**

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract:

1.6.1 Product Data including Material Safety Data Sheets (MSDS)

1.6.1.1 Asphalt

1.6.1.2 Asphalt primer

1.6.1.3 Wood fiber board

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Asphalt

ASTM D449, Type I or Type II.

2.1.2 Asphalt Primer

ASTM D41.

2.1.3 Protection Board

Wood Fiber Board, ASTM C208.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

##### **3.1.1 Surface Preparation**

The removal of form ties and repair all surface defects is covered in Specification Section 03300, Cast-in-Place Concrete. Clean concrete surfaces to receive dampproofing of foreign matter and loose particles.

##### **3.1.2 Moisture**

Moisture test substrate in accordance with ASTM D4263. If test indicates moisture, allow a minimum of 7 (seven) additional days after test completion for curing. If moisture still exists, redo the test until the substrate is dry.

#### **3.2 INSTALLATION, APPLICATION AND ERECTION**

##### **3.2.1 General**

Surfaces to receive dampproofing shall be smooth, clean, dry, free of ice, frost, deleterious substances, and projections. Dampproofing shall be applied using the hot-application method. Apply dampproofing after the priming coat is dry, but prior to any deterioration of the primed surface, and when the ambient temperature is above 40°F.

##### **3.2.2 Weather Restrictions**

###### **3.2.2.1 Inclement Weather**

Dampproofing shall not be applied in wet or rainy weather. Surfaces shall be dry before and during installation of materials.

###### **3.2.2.2 Cold Weather Limitations**

Dampproofing shall be applied when the ambient temperature is no lower than 40°F unless positive and approved methods are provided to protect the work during and after installation.

##### **3.2.3 Protection of Property**

###### **3.2.3.1 Flame-heated equipment shall be located and used so it will not endanger the structure, other materials on the site, or adjacent property. Fire extinguishers of an appropriate type and capacity shall be provided and maintained.**

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- 3.2.3.2 Before starting work, the paving and the faces of building walls adjacent to the work shall be protected. Heating kettles shall be placed not closer than 30 feet from any structure. Protection shall be maintained for the duration of the work.

3.2.4 Surface Priming

Prime surfaces to receive asphalt dampproofing with a coat of asphalt primer. Apply priming when the ambient temperature is above 40°F and at the rate of approximately one gallon per 100 square feet, fully covering the entire surface to be dampproofed.

3.2.5 Hot-Application Method

3.2.5.1 Heating Bitumen

- 3.2.5.1.1 Solid bitumen shall be broken up on a clean surface free of dirt and debris.

- 3.2.5.1.2 Bitumen shall be heated in kettles designed to prevent direct contact of the flame with the surfaces in contact with the bitumen. Flue effluent from the combustion system shall not exceed 450°F. A flue-outlet thermometer shall be installed and kept in calibration and working order. The kettle temperature shall not exceed 400°F.

- 3.2.5.1.3 Cutting back, adulterating, or fluxing bitumen will not be permitted.

3.2.5.2 Installation

- 3.2.5.2.1 Dampproofing shall be applied in accordance with the manufacturer's printed instructions and as specified.

- 3.2.5.2.2 Apply two mop coats of hot asphalt to primed surfaces. Apply mop coats uniformly using not less than 20 pounds of asphalt per 100 square feet for each coat. Do not heat asphalt above 400°. Have kettlemen in attendance at all times during the heating to ensure that the maximum temperature specified is not exceeded. Apply hot asphalt bitumen and fully bond to the primed surface. Provide a finished surface that is smooth, lustrous, and impervious to moisture. Recoat dull or porous spots.

- 3.2.5.2.3 Dampproofing shall extend from the bottom of the foundation to within 4 inches of the finished grade.

3.3 FIELD QUALITY CONTROL

- 3.3.1 Bitumen shall be sampled and tested in accordance with ASTM D140; and asphalt for dampproofing shall meet or exceed the physical requirements listed in ASTM D449, Table I, and shall be sampled

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and tested for softening point, flash point, penetration ductility, loss on heating, bitumen soluble in carbon disulfide, bitumen soluble in carbon tetrachloride, ash, and coarse particles.

- 3.3.2 All dampproofed surfaces shall be inspected. Damaged or improperly coated surfaces shall be repaired prior to placing wood fiberboards and backfilling.

3.4 **ADJUSTMENTS**

(Not Used)

3.5 **CLEANING**

Upon completion of the work remove all excess materials and debris promptly from the project site.

3.6 **PROTECTION**

Protect dampproofed surfaces against which backfill will be placed with 1/2 inch thick wood fiberboard.

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

**END OF SECTION**

SECTION 09875  
PRIMING OF STEEL  
(B-595-C-B210A-09875)

"APPROVED FOR CONSTRUCTION"


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ORIGINATOR:

 11/10/92  
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CHECKER:

 11/11/92  
J. L. Datte, Architectural Lead Date

APPROVED BY:

  
J. L. Datte Lead Discipline Engineer

11/11/92  
Date

NOV 15 1992

SECTION 09875  
PRIMING OF STEEL  
(B-595-C-B210A-09875)

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**SECTION 09875  
PRIMING OF STEEL**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section covers minimum technical requirements for the preparation of steel surfaces other than stainless steel, and the furnishing and application of primer coating pursuant to application of special coatings or high performance paints.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM B117	1990 Standard Test Method of Salt Spray (Fog) Testing
ASTM D520	1984 (Reapproved 1989) Standard Specification for Zinc Dust Pigment
ASTM D1005	1984 (Reapproved 1990) Standard Test Method for Measurement of Dry Film Thickness of Organic Coatings Using Micrometers
ASTM D2247	1987 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D4060	1984 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM G14	1988 Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)

**STEEL STRUCTURES PAINTING COUNCIL (SSPC)**

SSPC-PA1	1982 Shop, Field, and Maintenance Painting
SSPC-PA2	1982 Measurement of Dry Paint Thickness with Magnetic Gages

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SSPC-SP5	1989 Surface Preparation Specification No. 5, White Metal Blast Cleaning
SSPC-SP6	1989 Surface Preparation Specification No.6, Commercial Blast Cleaning
SSPC-SP7	1985 Surface Preparation Specification No. 7, Brush-Off Blast Cleaning
SSPC-SP10	1989 Surface Preparation Specification No. 10, Near-White Blast Cleaning
SSPC-PS Guide 12.00	1982 Guide for Selecting Zinc-Rich Painting Systems

### 1.3 RELATED REQUIREMENTS

(Not Used)

### 1.4 DEFINITIONS

1.4.1 DFT - Dry Film Thickness

### 1.5 SYSTEM DESCRIPTION

(Not Used)

### 1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract:

#### 1.6.1 Product Data

Submit manufacturer's published technical information including Material Safety Data Sheets (MSDS), and application instructions for each primer specified or proposed.

#### 1.6.2 Test Reports

Submit test reports made within the previous three years of the date of issue of this section on samples of the products proposed for the work. Such test reports shall be by nationally recognized laboratories or laboratories acceptable to the Buyer. Test Reports shall include dates of testing, locations from which samples were obtained, and test results including bond strengths, abrasion resistance, impact resistance, chemical resistance,

temperature resistance, radiation resistance, and results of tests referred to in SSPC Paint 20, SSPC-PS Guide 12.00, and in Part 2 of this specification section.

1.6.3 Operation and Maintenance (O&M) Manuals

Submit manufacturer's printed application, maintenance, and repair instructions, including mixing instructions, pot life, storage requirements, surface preparation requirements, safety requirements, and intervals of monitoring and inspection.

1.6.4 Manufacturer's Approval of Applicator

Submit written approval of applicator by manufacturer of steel primer.

1.6.5 Installer's Experience

Submit written documentation of experience as specified in Subparagraph 1.9.3 below.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

1.9 QUALITY ASSURANCE

1.9.1 General

Quality assurance of priming of steel shall conform to requirements of SSPC-PS Guide 12.00.

1.9.2 Materials

All materials used for priming of steel, including thinners, cleaners, driers, and other additives shall be products of a single manufacturer. Application of multiple manufacturers' products is strictly prohibited.

1.9.3 Installer

Primer specified in this section shall be prepared and installed by an installer approved by the manufacturer of the materials and having a minimum of five continuous years experience installing specified primer. Documentation supporting the required experience shall be submitted to the Buyer to demonstrate experience on projects of similar size and complexity.

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## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 General

Materials shall conform to requirements of SSPC-PS 20, Type I.

#### 2.1.2 Zinc Dust

Zinc dust shall conform to ASTM D520.

#### 2.1.3 Products

The products herein described are manufactured by Ameron, PCD, Brea California. They are intended to establish minimum acceptable standards of quality of materials, finish, and performance, and are not intended to exclude from consideration comparable products of other manufacturers. Products of other manufacturers will be permitted provided such materials are of equal quality and of the required characteristics for the purpose intended, subject to authorization by the Buyer.

##### 2.1.3.1 Primer 1 [Dimetcote 21-5]

Two component, water-based inorganic zinc silicate exhibiting the following properties: zero VOC; salt spray (ASTM B117) after 5000 hours showing no face corrosion or blistering; humidity (ASTM D2247) after 720 hours showing no face corrosion; abrasion (ASTM D4060), with 1 kg load/1000 cycles, CS-17 wheel, weight loss not to exceed 40 mg; impact (ASTM G14), not less than 160 inch-pounds. Temperature resistance when dry shall be not less than 750°F.

##### 2.1.3.2 Primer 2 [Dimetcote 21-9]

Two component, solvent-based (ethyl silicate) inorganic zinc primer exhibiting the following properties: VOC not to exceed 293 g/L mixed, 331 g/L mixed and thinned (1/2 pint thinner per gallon primer); salt spray (ASTM B117) after 5000 hours showing no face corrosion or blistering; humidity (ASTM D2247) after 720 hours showing no face corrosion; abrasion (ASTM D4060), with 1 kg load/1000 cycles, CS-17 wheel, weight loss not to exceed 40 mg; impact (ASTM G14), not less than 160 inch-pounds. Temperature resistance when dry shall be not less than 750°F.

### 2.2 FABRICATION AND MANUFACTURE

(Not Used)

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## 2.3 FINISHES

### 2.3.1 Colors

2.3.1.1 Colors shall be as selected by the Buyer from the manufacturer's standard samples.

2.3.1.2 Formulate colors with colorants free of lead and lead compounds.

2.3.1.3 Where more than one coat of material is applied within a given system, alternate color hues per coat shall be used to provide a visual reference that the required number of coats have been applied (and also to indicate when overlying coats have been damaged).

## PART 3 EXECUTION

### 3.1 PREPARATION

#### 3.1.1 General

Surfaces shall be prepared in accordance with the more stringent requirements of SSPC-PS Guide 12.00, or the primer manufacturer's written requirements, or as herein specified. Surfaces shall be free of grease, oil, and other contaminants before further mechanical or chemical preparation. All surfaces shall be prepared with the objective of obtaining a clean, dry, and properly prepared substrate. Round off all rough welds and sharp edges, and remove all weld spatter.

#### 3.1.2 Blasting

Abrasive blast SSPC-SP5, or SSPC-SP10 to achieve a 1 to 2 mil (25-50 microns) anchor profile. Remove abrasive residue or dust from surface.

#### 3.1.3 Stainless Steel Surfaces

Stainless steel surfaces shall be excluded from requirements of this specification section.

#### 3.1.4 Galvanized Surfaces

Remove oil, soap film or grease from surface with neutral detergent or emulsion cleaner or roughen surface by light abrasive blast SSPC-SP7.

#### 3.1.5 Rusted Surfaces

Remove rusted spots by blasting SSPC-SP6 or SSPC-SP7.

3.1.6 Solvent Wiping

Not permitted.

3.1.7 Mixing

3.1.7.1 Prepare multiple-component primer using all contents of each component container as packaged by the primer manufacturer. No partial batches will be permitted.

3.1.7.2 Do not use mixed multiple-component primer beyond pot life. Provide small quantity kits for touch-up and for patching other small areas.

3.1.7.3 Mix only the components specified and furnished by the primer manufacturer.

3.1.7.4 Do not intermix additional components for reasons of color or otherwise, even with the same generic type of primer.

3.2 INSTALLATION, APPLICATION, AND ERECTION

3.2.1 General

Application shall be in accordance with SSPC-PA1 and the manufacturer's written instructions unless otherwise specified.

3.2.2 Environmental Conditions

Temperature of materials and substrate shall be in accordance with the manufacturer's written instructions. If the manufacturer has no written instructions, then the material and substrate shall both be between 40°F and 120°F for 24 hours before, during, and after application, through the curing and drying periods, unless otherwise specified.

3.2.3 Humidity

Humidity shall be measured in the area receiving primer. The humidity shall be within the range specified in the manufacturer's written instructions. If the manufacturer has no written instructions, no material shall be applied when the relative humidity is above 85% or the temperature of the surface is less than 5°F above the dew point unless otherwise specified.

3.2.4 Application

Application by spray equipment is preferred to assure complete coverage.

3.2.5 Thinning

Primer shall not be thinned unless specifically permitted by manufacturer's written instructions.

3.2.6 Finish

Apply each coat to uniform finish, free of runs, sags, lap marks, air bubbles, and pin holes. Damaged areas shall be resprayed.

3.2.7 Number of Coats

The number of coats is the minimum required irrespective of the coating thickness. Additional coats may be required to obtain the minimum required coating thickness. Do not apply succeeding coats until previous coat has cured as recommended by primer manufacturer.

3.2.8 Material Thickness

Thickness shall be measured in accordance with ASTM D1005 or SSPC-PA2. Thickness shall not exceed manufacturer's written recommendations.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.3.1 Shop Quality Control

The Buyer reserves the right to invoke the following material testing procedure at any time, and any number of times during the work: the Buyer may engage the services of an independent testing laboratory to sample materials being used. Samples of materials delivered to the shop or field will be taken, identified, sealed, and certified in the presence of the Seller; the testing laboratory may perform appropriate tests to verify requirements specified in SSPC Paint 20, SSPC-PS Guide 12.00, and in Part 2 of this specification section.

3.4 ADJUSTMENTS

3.4.1 Repairs

3.4.1.1 Damaged Coatings, Pinholes, and Holidays

Edges shall be feathered and repaired using the primer materials specified for the original work, unless otherwise specified, in accordance with written recommendations of the primer manufacturer.

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3.4.1.2 Touch-up painting shall be in accordance with SSPC-PA1.

3.4.1.3 Apply all primer coats, including touch-up and damage repair coats in a manner which will present a uniform texture and color-matched appearance.

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

Apply primers in accordance with the following schedule:

**SYSTEM A**

Primer 1 1 coat @ 3 mils DFT minimum

or

Primer 2 1 coat @ 4 mils DFT minimum

**END OF SECTION**



SECTION 13252  
PRECAUTIONS FOR FABRICATION, HANDLING AND  
STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS  
(B-595-C-B210A-13252)

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SECTION 13252  
PRECAUTIONS FOR FABRICATION, HANDLING AND  
STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the technical requirements for handling, fabrication, shipment and storage techniques to minimize the risk of contamination of stainless steel and nickel alloys. Contaminating compounds are those which contain free iron, sulfur, chlorides and low-melting-point metals.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME N45.2.1                      1980 Cleaning of Fluid Systems and  
Associated Components for Nuclear Power  
Plants

Boiler and Pressure Vessel Codes

ASME Section V                      1989 Nondestructive Examination

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A380                      1978 Standard Practice for Cleaning and  
Descaling Stainless Steel Parts,  
Equipment, and Systems

ASTM D129                      1991 Standard Test Method for Sulfur in  
Petroleum Products (General Bomb Method)

ASTM D808                      1991 Standard Test Method for Chlorine in  
New and Used Petroleum Products (Bomb  
Method)

ASTM D1552                      1990 Standard Test Method for Sulfur in  
Petroleum Products (High Temperature  
Method)

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR, Ch. 1  
Part 143

1990 National Secondary Drinking  
Water Regulations

1.3 **RELATED REQUIREMENTS**

(Not Used)

1.4 **DEFINITIONS**

MIC - Microbiological Influenced Corrosion

ppm - Parts Per Million

SCC - Stress Corrosion Cracking

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Seller's procedure for handling, cleaning, isolation and storage of stainless steel and nickel alloys shall be submitted for Buyer approval. These procedures shall be submitted prior to the start of fabrication.
- 1.6.2 A chemical analysis shall be submitted for materials that are not intended to be removed after fabrication. Examples of these materials are: lubricants, thread compound, nondestructive examination materials, etc. Submit for Buyer review.
- 1.6.3 Seller's procedure for drying of equipment and piping shall be submitted for Buyer approval. The procedure shall identify the means of verifying that all water has been dried from pockets and low points after hydrostatic testing. Drying gas quality shall also be specified in procedures.
- 1.6.4 Biocide water treatment procedures shall be submitted for Buyer approval.
- 1.6.5 Water chemistry and biocide material data sheet shall be submitted for Buyer approval. This information shall be submitted prior to hydrostatic testing.

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1.6.6 Procedure for the isolation and separation of stainless steel wire brushes and grinding material shall be submitted for Buyer approval.

1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

**PART 2 PRODUCTS**

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 All limitations specified, e.g., percent, parts per million (ppm), etc. are to be by weight.

2.1.2 All consumables and materials used during fabrication shall meet the following general requirements unless addressed in more detail in this specification section.

2.1.2.1 Maximum chloride content shall be 250 ppm.

2.1.2.2 Maximum sulfur content shall be 1 percent.

2.1.2.3 Low melting point elements (such as cadmium, lead, mercury, tin and zinc) shall not be added.

2.1.3 **Carbon Steel Contamination**

2.1.3.1 Tools and equipment used to cut, form and handle stainless steel and nickel alloys shall be in accordance with one of the following requirements:

A. Tools and equipment shall be hardened tool steel or chrome plated.

B. Surfaces of non-stainless steel tools and equipment which come into contact with stainless steel shall be covered either with paper, plastic or stainless steel sheet.

2.1.3.2 Grinding equipment and stainless steel wire brushes previously used on carbon steel shall not be used on stainless steel and nickel alloys.

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- 2.1.3.3 Temporary attachments for welding or fabrication shall be of a similar grade material (e.g., 300 series stainless steel shall be used for a temporary attachment to 304L stainless steel) to the pressure component.
- 2.1.3.4 If scaffolding or ladders are used during fabrication, the contact surfaces at the stainless steel or nickel alloy interface shall be protected either by wood or plastic. No direct contact shall be permitted.
- 2.1.3.5 Areas used for fabrication of stainless steel and nickel alloys shall be separate from carbon steel fabrication areas. These areas shall be kept free of carbon steel shavings and grinding dust.
- 2.1.3.6 Where it is not possible to provide protection from carbon steel, the components shall be chemically cleaned to dissolve any carbon steel which may be embedded in the stainless steel or nickel alloy surface. The cleaning requirements shall be in accordance with ASTM A380.
- 2.1.3.7 Non-metallic slings shall be used when safe to do so. Lifting with carbon steel chains from lifting lugs is acceptable. Chemically clean lugs prior to shipment of equipment. Cleaning shall be in accordance with Paragraph 2.1.3.6.
- 2.1.3.8 Carbon steel strapping material used for shipping shall not contact stainless steel or nickel alloy equipment or piping.
- 2.1.3.9 Surfaces that are found to be contaminated with carbon steel shall be restored. Mechanical descaling is the preferred method. It shall be performed in accordance with ASTM A380.
- 2.1.3.10 Walking directly upon stainless steel surfaces shall be avoided where possible. Surfaces upon which walking access is required shall be protectively covered with kraft paper, cardboard, plastic or equivalent.
- 2.1.3.11 Acceptable Carbon Steel Contamination
- Carbon steel contamination shall be verified in accordance with ASTM A380. Scattered areas of rust are permissible provided the aggregate area does not exceed 2 sq. in. in any 1 sq. ft. area.
- 2.1.4 Wrapping and Protective Covering Materials
- 2.1.4.1 No chloride restriction shall apply to wrapping and protective covering material (such as polyethylene and polyvinyl chloride (PVC) films) when used for packaging or storage purposes. PVC caps, plugs and packaging material shall not be reused.

- 2.1.4.2 No chloride restriction shall apply to pressure-sensitive tapes or adhesive-backed tapes. Pressure-sensitive tapes or adhesive-backed tapes shall not be used within 12 inches of any area where local heating or welding may increase the metal temperature to 180°F or higher.
- 2.1.4.3 Where tape is used during welding for back purging, the tape shall be of a low-chloride (less than 250 ppm) type (Stockwell Rubber Company G-568 or equal).
- 2.1.4.4 After pressure-sensitive and adhesive-backed tapes are no longer required they shall be removed. Any remaining residual adhesive shall be removed. Acetone or solvent shall be used. Solvent shall be in accordance with Paragraph 2.1.7.
- 2.1.5 Grinding Discs, Abrasive Discs, Brushes and Material Removal Tools
- 2.1.5.1 Grinding discs, abrasive discs and brushes shall be designated for use on stainless steel and nickel base alloys. These materials shall not have been previously used on carbon steel, low alloy steels or nonferrous metals and their alloys.
- 2.1.5.2 Grinding discs, abrasive discs and belts shall be of resin-bonded alumina, silicon carbide or zirconium carbide. Sulfurized compounds shall not be used as a bonding material.
- 2.1.5.3 Only 300 series stainless steel brushes shall be used on stainless steel and nickel base alloys.
- 2.1.5.4 All material removal and cleaning tools shall be marked to identify that they are to be used on stainless steel and nickel alloys only. Marking shall be visible while tool is in use.
- 2.1.6 Nondestructive Examination Materials
- 2.1.6.1 Sulfur and halogen content of liquid penetrant materials shall be in accordance with the requirements of T-625, Article 6, ASME Section V.
- 2.1.7 Cleaning Fluids
- Chlorinated hydrocarbon solvents may be used for stainless steel cleaning provided they are analyzed for total residual chlorine and sulfur. The analysis process is as follows:
- A. Select and weigh a glass Petri dish of 150mm nominal diameter. Note the weight.
  - B. Pour a 100 gram sample of the solvent into the Petri dish.

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- C. Heat the sample for 60 minutes. The heating temperature shall be between 194°F and 212°F, inclusive.
- D. Weigh the Petri dish again. Subtract the weight noted in Step A from the new weight. This is the weight of the solvent residue.
- 1) If the residue is less than 0.005 grams, the solvent is acceptable. No further analysis is required.
  - 2) If the residue weight is 0.005 grams or more, repeat Steps A through C. Test the residue in accordance with ASTM D129 or ASTM D1552 for sulfur content. Test the residue in accordance with ASTM D808 for halogen content.

The sulfur or chlorine content shall not exceed 1 percent of the residue by weight in any case.

## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 Hydrostatic Test Water Quality

The intent of the following guidelines is to minimize the risk of chloride stress corrosion cracking (SCC) and microbiological influenced corrosion (MIC).

### 2.2.2 Water quality shall meet the following requirements for equipment and piping that can be drained and completely dried or when specified by the contract documents.

#### 2.2.2.1 Water used for testing shall be clean, filtered, chlorinated water. The free residual chlorine content of this water shall not be more than 0.1 ppm. It shall be in accordance with the following water chemistry and requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 35 ppm.
- C. Fluoride content shall be less than 5 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Total dissolved solids shall be less than 500 ppm.
- F. Treated with a biocide for the specific normal population of bacteria.



Potable water which meets the Code of Federal Regulations 40 CFR, Chapter 1, Part 143 requirements should satisfy these chemistry limits.

The test water shall be analyzed before pipes are filled. The free residual chlorine content of the water shall be determined.

2.2.2.2 Test water and piping surface temperature shall not exceed 140°F at any time during hydrostatic test or drying operations. If a temperature in excess of 140°F is necessary to dry equipment or piping, deionized water shall be used. Deionized water shall meet the requirements of Paragraph 2.2.3.

2.2.2.3 Piping shall be completely drained and thoroughly dried within 48 hours of hydrostatic testing. Acceptable methods of drying include mopping, wiping or blow drying with cool (less than 140°F) nitrogen. Seller shall submit a drying procedure for Buyer approval in accordance with Paragraph 1.6.3.

2.2.3 Deionized water shall be used for hydrostatic testing of piping that can only be dried through evaporation or when specified in contract documents. The water and methods shall be in accordance with the following paragraphs:

2.2.3.1 Deionized water shall meet the following requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 1 ppm.
- C. Fluoride content shall be less than 1 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Conductivity at 77°F shall not exceed 3 micromho/cm.
- F. Silica content shall not exceed 0.05 ppm.
- G. Total suspended solids shall not exceed 3 ppm.
- H. Treated with a biocide for the specific normal population of bacteria.

Steam condensate or demineralized water should satisfy the above requirements. The above water chemistry requirements are in accordance with ASME N45.2.1.

The test water shall be analyzed before piping is filled.

2.2.3.2 Piping shall be sealed and maintained in clean condition once testing is complete.

- 2.2.3.3 Any hydrostatic test condition or procedure not addressed by the above paragraphs shall be submitted for Buyer approval prior to the start of testing.
- 2.2.4 Extended Hydrostatic Test
- 2.2.4.1 If piping is subjected to extended hydrostatic test or wet layup condition (greater than 48 hours) the test water shall be analyzed for microbiological contamination. An acceptable biocide test kit shall be used (Bioindustrial Technologies Incorporated - MICKIT™ or equal).
- 2.2.4.2 If necessary, the water shall be treated on a daily basis with a biocide to minimize the risk of microbiological contamination. Examples of acceptable biocides are chlorine (0.2 ppm) and hydrogen peroxide. Seller shall select the proper biocide according to the analyzed water chemistry. Seller shall also submit a material data sheet on the intended biocide for Buyer approval.
- 2.2.5 Cleaning Requirements
- All surfaces to be welded shall be free of paint, oil, grease, dirt and other foreign materials detrimental to the weld soundness. An area 4 inches wide minimum on each side of weld joint shall be cleaned. Acceptable cleaning methods shall be mechanical or chemical methods in accordance with ASTM A380.

### PART 3 EXECUTION

#### 3.1 PREPARATION

(Not Used)

#### 3.2 INSTALLATION, APPLICATION AND ERECTION

- 3.2.1 After welding all foreign materials such as flux, anti-spatter compound, slag and spatter shall be removed. Removal can be accomplished either by mechanical or chemical methods.
- 3.2.2 Heat tint (dark blue coloring) and scale shall be permitted on nonprocess side of weld joint. Light heat tint (straw or gold colored) shall be permitted on the process side of weld joint. When required, heat tint and scale can be removed either by mechanical or chemical descaling methods. For mechanical descaling, precleaning and postcleaning is required.
- 3.2.3 Liquid penetrant and ultrasonic examination materials shall be completely removed from surface after examination. Removal shall

be in accordance both with manufacturer's recommendation and this specification section.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

SECTION 15196  
IDENTIFICATION AND TAGGING METHODS  
FOR MECHANICAL EQUIPMENT  
(B-595-C-B210A-15196)

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SECTION 15196  
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 FOR MECHANICAL EQUIPMENT  
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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>	<u>REV. NO.</u>
A	LAYOUT EXHIBITS (TYPICAL)	0

94302.019

## 1.1 SUMMARY

## 1.2 REFERENCES

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1 1981 (Rev. 85) Scheme for the Identification of Piping Systems

## MILITARY STANDARDS

MIL-STD-889B 1988 (Notice 2) Dissimilar Metals

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 29 CFR 1910.96 1990 Ionizing Radiation

### 1.3 RELATED REQUIREMENTS

(Not Used)

## 1.4 DEFINITIONS

ISR - Inspection/Surveillance Report

## 1.5 SYSTEM DESCRIPTION

(Not Used)

**1.6 SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

**1.6.1** Seller shall submit certification that materials used for the application and removal of marking on corrosion-resistant, stainless steel and some nickel-based alloys shall be free of halides and low melting-point elements to the extent specified in Paragraph 2.1.1.1 B. Written certification by the manufacturer that their product does not exceed the halide and elemental content specified in Paragraph 2.1.1.1 B is acceptable and shall preclude the necessity for an acceptance test of that product.

**1.6.2** Seller shall submit certification of the processes used for permanent marking. Tools used to apply permanent marking and the resultant mark shall be in accordance with the applicable requirements in Paragraph 2.2. To preclude repeated examination of production marking, tools and sample markings made by said tools shall be examined to determine accordance with applicable requirements. Upon successfully testing the tool on the material to be marked, the process shall be certified by Quality Assurance for production use on an Inspection/Surveillance Report (ISR).

**1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS**

(Not Used)

**1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

**PART 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

**2.1.1 Materials**

**2.1.1.1** Material Compatibility - Materials used for permanent or temporary marking or for the removal of markings shall be physically and chemically compatible with the material to which the markings will be applied or removed. The following shall be avoided:

A. The use of dissimilar metals in permanent contact as defined in MIL-STD-889B.

- B. The use on corrosion-resistant, stainless steel and some nickel-base alloys of materials containing more than:
- 1) one-half percent by weight of halides (chlorides and fluorides),
  - 2) one-half percent by weight of sulfur, and
  - 3) a sum total of one-half percent by weight of low melting-point elements such as cadmium, aluminum, lead, zinc and mercury.
- C. Permanent marking of critical stainless steel components using labels, tape, paint or other marking materials that could cause crevice corrosion.

## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 Requirements

2.2.1.1 Cleanliness - Surfaces to be marked shall be cleaned of oil, grease, dirt, corrosion or any other material that would adversely affect the application or adhesion of the marking.

2.2.1.2 Legibility - All markings shall be clearly legible. Color markings, including black and white, shall contrast with the color of the surface to which it is applied. Freehand lettering for the purpose of temporary marking shall be in the printed form and be uppercase (caps).

### 2.2.2 Permanent Identification Methods

- |         |  |
|---------|--|
| Type 1  | Vibratory Marking                                |
| Type 2  | Die Stamping                                     |
| Type 3  | Raised marking forged or cast into the surface   |
| Type 4  | Recessed marking forged or cast into the surface |
| Type 5  | Electrochemical etch                             |
| Type 6  | Nameplate  |
| Type 7  | Self-adhesive label                              |
| Type 8  | Painting   |
| Type 9  | Packaging  |
| Type 10 | Tagging  |

2.2.2.1 Type 1: Vibratory Marking - Vibrating tools shall be fitted with a carbide marking point or equivalent. Tools shall be adjusted to produce a shallow, rounded impression 0.003 to .101 inch in depth. The marking tool tip minimum radius shall be 0.005 inch. The size (height) of characters produced by vibratory marking shall be selected within the range of 1/16 to 1/2 inch.



- 2.2.2.2 Type 2: Die Stamping - Die stamps shall be low-stress type stamps. The minimum tip radius of the dies shall be in accordance with the following character sizes:

Character Size (Inch)	Minimum Tip Radius (Inch)
1/16	0.005
3/32	0.006
1/8	0.007
3/16	0.008
1/4	0.010
3/8	0.012
1/2	0.014

- A. Impression depth shall not exceed 0.10 inch.
- B. Die stamp marking shall be applied to a flange, an integrally-cast or forged boss or pad, the base or support of the item or other visible low-stress location.
- C. The material thickness of an item to be marked shall not be reduced by die stamping to less than the minimum specified on the component drawing or specification (if available).

- 2.2.2.3 Types 3 and 4: Raised/Recessed Markings - Raised or recessed identification markings that are cast into the surface of the item are acceptable. Recessed markings shall not reduce the material thickness of an item to less than the minimum specified on the component drawing or specification. The size of forged or cast characters called out on the drawing or specification shall only be limited by the space available, but shall in no case be less than 0.09 inch in height.

- 2.2.2.4 Type 5: Electrochemical Etching - The electrolyte and neutralizer used for electrochemical etching shall be compatible with the material to be marked. The depth of etching shall be no greater than 0.5 percent of the material thickness or 0.003 inch, whichever is less. The size of characters produced by electrochemical etching shall be selected within the range of 1/16 to 1/2 inch. However, the recommended minimum size is 0.1 inch to accommodate typing applications.

- 2.2.2.5 Type 6: Nameplates

- A. The physical requirements (e.g., material, nameplate dimensions, character size and arrangement) for metal nameplates shall either be detailed on the applicable drawing or specification; or defined by reference to an applicable nameplate standard, specification or drawing. Metal

nameplates shall be corrosion-resistant. They shall contain not less than the following information:

Equipment description  
Purchase order number  
Equipment item number  
Seller's name (if different from manufacturer)  
Manufacturer's name  
Manufacturer's model number  
Manufacturer's serial number  
Rated capacity  
Size and type  
Year built  
Project identification

A typical metal nameplate layout is shown in Attachment A.

- B. When attached by welding, metal nameplates shall be welded in accordance with the welding requirements applicable to the item. The attachment method and location on the item of either nameplate type shall be established on the basis of stress imposed on the item. The method shall consider possible crevice corrosion between the nameplate and the item surface.

2.2.2.6 Type 7: Self-Adhesive Labels - Self-adhesive labels may be used for identification provided they are in accordance with the requirements specified in Paragraph 2.1.1.1. When used to mark components in systems such as piping or electrical systems, or used as regulatory marking, self-adhesive labels shall be in accordance with applicable government, society or industry standards and codes. For example:

- A. When marking a piping system, a recognized standard such as ANSI A13.1 shall be invoked on the applicable drawing/specification along with this specification section.
- B. If labels are used to identify system or component radiation hazards, a standard such as OSHA 29 CFR Section 1910.96 shall be specified on the applicable drawing/specification along with this specification section.

2.2.2.7 Type 8: Painting - Paints suitable for the purpose and/or as specified shall be used to apply stenciled markings to items (see Paragraphs 2.1.1.1 and 2.2.1.2). Stenciled markings may be applied using a template or silkscreen. The size of the stenciled characters specified on the drawing/specification shall be selected within the range of 1/3 to 3 inches. The color and type of paint to be used shall also be in accordance with the drawing/specification. Crafted (freehand sign painted)

application of marking in lieu of stenciling is acceptable with due consideration being given to the higher cost involved.

2.2.2.8 Type 9: Packaging - Identical items too small to be identified individually may be packaged in a box or bag marked with the item identification as shown in Paragraph 2.2.2.9 A.

2.2.2.9 Type 10: Tagging

A. Tags shall be of corrosion-resistant metal. They shall be impression-stamped with not less than the following information:

Purchase order number  
Purchase order item number  
Equipment item number

A typical tag layout is shown in Attachment A.

B. Tags shall be attached to the component they identify with stainless steel wire. Tagging is done in addition to the equipment nameplate. Equipment shipped in fully-enclosed containers shall have the information from A. clearly marked on the container exterior.

C. Miscellaneous parts shall be tagged or marked with the equipment item number for which they are intended.

D. Equipment which contains insulating oils, antifreeze solutions or other liquids shall be prominently tagged at every opening. Tags shall indicate the nature of the contents and precautions for shipping and storage.

2.2.3 Temporary Identification Methods

Type A	Rubber stamp and ink
Type B	Rubber roller or wheel and ink
Type C	Felt-tip marking pen
Type D	Removable self-adhesive label or tape
Type E	Label attached with removable tape
Type F	Removable tag
Type G	Packaging
Type H	Scribing tool
Type J	Paint stick
Type K	Metal tag

2.2.3.1 Inks - Inks used for all type of temporary markings including felt-tipped pens, rubber stamps, rubber roller and rubber wheel shall be in accordance with the requirements of Paragraph 2.1.1.1 B.

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- 2.2.3.2 Self-Adhesive Labels and Tape - The adhesives of self-adhesive labels and tape used for temporary marking shall be in accordance with the requirements of Paragraph 2.1.1.1.
- 2.2.3.3 Tagging - Items not suited for other methods of identification may be tagged. Tags and attaching materials shall be compatible with the item material in accordance with Paragraphs 2.1.1.1 A and 2.1.1.1 B. Materials used for temporary identification tagging shall be selected on the same basis as for permanent identification tagging (see Paragraph 2.2.2.9).
- 2.2.3.4 Packaging - Packaging requirements for temporary identification shall be the same as for permanent identification (see Paragraph 2.2.2.8).
- 2.2.3.5 Scribing Tool - Scribing tools may be used for temporary identification during fabrication or construction provided such marking is not applied to critical surfaces such as finished, machined or sealing surfaces.
- 2.2.3.6 Removal of Temporary Marking - All temporary marking shall be removed from stainless steel and corrosion-resistant material surfaces prior to fabrication operations which render markings inaccessible, prior to heat treatment and prior to post-manufacturing acceptance or post-installation acceptance, as appropriate. Ink markings and residue from tapes shall be removed using new or re-distilled alcohol or acetone. The removal of temporary markings shall assure cleanliness of the material and be in accordance with applicable cleanliness acceptance criteria.
- 2.2.4 Testing
- 2.2.4.1 Visual Inspection - Item surfaces and marking shall be visually inspected to determine accordance with the applicable requirements specified in Paragraphs 2.2.1.1 and 2.2.1.2.

**PART 3 EXECUTION**  
  
(Not Used)

**END OF SECTION**

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ATTACHMENT A  
LAYOUT EXHIBITS (TYPICAL)

EXHIBIT 1. NAMEPLATE LAYOUT (TYPICAL)

P.O. NUMBER	ITEM NUMBER
SERIAL NUMBER	MODEL NUMBER
EQUIPMENT DESCRIPTION	
MANUFACTURED BY	
SIZE	TYPE
RATED CAPACITY	YEAR BUILT
PROJECT	

EXHIBIT 2. TAG LAYOUT (TYPICAL)

P.O. NUMBER
P.O. ITEM NUMBER
EQUIPMENT ITEM NUMBER

SECTION 15250  
MECHANICAL INSULATION  
(B-595-C-B210A-15250)

REFERENCE DOCUMENT

REVISION NO. C  
ISSUE DATE 29 OCTOBER, 1992

WAPA YES    NO X  
QUALITY LEVEL I    II X  
SAFETY CLASS 1    2    3 X 4   

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NOV 16 1992

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SECTION 15250  
MECHANICAL INSULATION

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**ATTACHMENTS**

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ATTACHMENT A	INSULATION CONSTRUCTION DETAILS	C

9413202.0160

**SECTION 15250  
MECHANICAL INSULATION**

**PART 1 GENERAL**

**1.1 SUMMARY**

This specification covers the requirements for the purchasing, fabrication, and application of insulation for piping.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A 312/A 312M	1991 Seamless and Welded Austenitic Stainless Steel Pipes
ASTM C 195	1990 Mineral Fiber Thermal Insulating Cement
ASTM C 533	1985 Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 552	1988 Cellular Glass Thermal Insulation
ASTM C 585	1990 Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
ASTM C 795	1989 Wicking-Type Thermal Insulation for Use Over Austenitic Stainless Steel
ASTM E 84	1990 Surface Burning Characteristics of Building Materials

**1.3 RELATED REQUIREMENTS**

Drawing H-2-124091 Sheet 1    Piping Vit Building Standard Fabrication Details

**1.4 DEFINITIONS**

Not Used.

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## 1.5 SYSTEM DESCRIPTION

### 1.5.1 Design/Performance Requirements

- A. Insulation is to be provided for heat conservation, and/or process or control.
- B. Insulation symbols as shown on the contract drawings are defined as follows:

<u>Insulation Symbol</u>	<u>Description</u>
IH	Hot insulation - for heat conservation and process control

## 1.6 SUBMITTALS

Submit the following in accordance Part III, Section I, Exhibit 5, of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

### 1.6.1 Product Data

- A. One sample of each type of pipe cover insulation and removable cover insulation to be used.
- B. Manufacturer's data sheets for each type of insulation and accessory material to be used.

### 1.6.2 Manufacturer's instructions, covering handling, installation, storage and maintenance.

## 1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

Not used.

## 1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

Not used.

## PART 2 PRODUCTS

### 2.1 MATERIALS/EQUIPMENT

- 2.1.1 Insulation thicknesses shall be one inch (1") for all piping, unless shown otherwise on the Drawings.

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2.1.2 Insulation materials shall have surface burning characteristics as determined by ASTM E 84 not to exceed 20 for flame spread and 50 for smoke developed.

2.1.3 All insulation shall conform to ASTM C 795.

#### 2.1.4 Pipe Insulation

Dimensions of all pipe covers shall conform to ASTM C 585.

#### 2.1.5 Insulation for Embedded Piping

- A. Insulation supports for embedded piping shall be Cellular Glass per ASTM C 552. Pittsburgh Corning "Foamglas" or approved equal.
- B. Insulation for fittings and straight runs of pipe shall be fiberglass material per ASTM C 195. Pittsburgh Corning "Temp-Mat" or approved equal.
- C. Insulation for pipe Anchors shall be high compressive strength calcium silicate per ASTM C 533 designed in accordance with Attachment A. Manville Marinite or approved equal.

#### 2.1.6 Jacketing and Securement for Embedded Piping

- A. Jacketing shall be Stainless Steel Pipe, ASTM A 312/312M, Grade 304 Schedule 5S.
- B. .016" thick (27 Gauge), type 304 stainless steel bands for metal jacket.
- C. Minimum 6" wide x .015" thick, type 304 stainless steel sheet.

### 2.2 FABRICATION AND MANUFACTURE

#### 2.2.1 Packaging and Shipping

Preparation for shipment shall conform to the manufacturer's standard, as a minimum shall provide protection against weathering, and damage from normal handling and storage.

### PART 3 EXECUTION

#### 3.1 PREPARATION

(Not Used)

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### 3.2 INSTALLATION APPLICATION AND ERECTION

#### 3.2.1 GENERAL

- A. Piping shall be insulated when indicated on the Contract Drawings and Documents.
- B. Insulation materials shall be kept dry and shall not be applied wet. If materials become wet after application, they shall be dried or replaced before proceeding with application of jacketing or weatherproofing compound.
- C. Pressure tests, shall, if possible, be completed before insulation is installed. If insulation is applied before testing, all joints shall be left uninsulated and exposed until completion of testing. Shop welds may be insulated prior to field test if the piping has been tested in the shop.

#### 3.2.2 Application - Embedded Insulation

- A. Straight runs of stainless steel jacketing shall be joined together, using stainless steel sheet and bands, as specified in Attachment A.
- B. Assembly of jacketing around elbows, bends, and fittings shall be joined together using tack welds as specified in Attachment A, details #1 & #2.
- C. If required for ease of installation, straight runs of fiberglass insulation may be secured to pipe using 16 gauge wire prior to installation of jacket. Seller may adjust wiring centers and wiring tension to compress insulation sufficiently to allow insertion of insulated pipe into jacketing.
- D. Installation of fiberglass insulation around bends and elbows shall be cut to fit during assembly.
- E. Pipe supports shall be 6" wide full circumferential sections of cellular glass. The sections are to be cut such that a 1/8" clearance is maintained between the O.D. of the insulation and the I.D. of the insulation jacketing. The clearance between the O.D. of the pipe and the I.D. of the insulation shall be per ASTM C 585. Support spacing shall be a maximum of 10 feet.
- F. If required for ease of installation, the insulation jacketing elbows may be cut in half longitudinally and closed using a seal weld.

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### 3.3 FIELD QUALITY CONTROL

3.3.1 The installed insulation system shall be inspected by Seller for conformance with this specification, pertinent drawings, and Manufacturer's installation procedures. Areas to be included in the inspection are, but not limited to :

- A. Surface to be insulated is free of all moisture, grease and other foreign material.
- B. Correct insulation extent, type and thickness installed.
- C. Installed insulation and jacketing is dry and undamaged. Bands and all securing devices are spaced according to the specified limits.
- D. Storage, handling, and application of jacketing is per this specification section.

### 3.4 ADJUSTMENTS

(Not Used)

### 3.5 CLEANING

(Not Used)

### 3.6 PROTECTION

(Not Used)

### 3.7 DEMONSTRATION

(Not Used)

### 3.8 SCHEDULES

(Not Used)

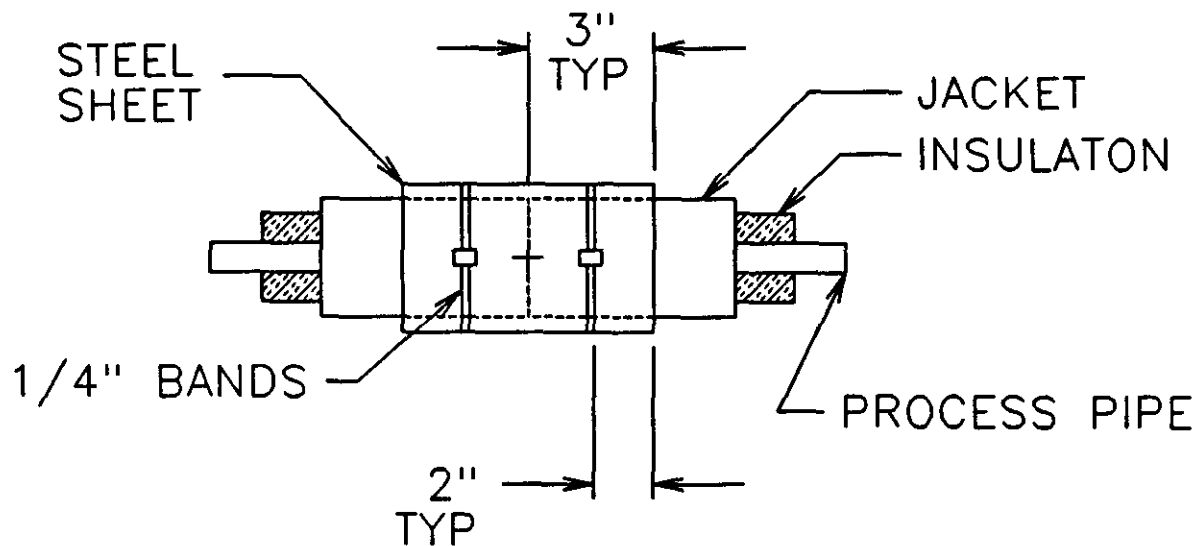
END OF SECTION

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ATTACHMENT A  
INSULATION CONSTRUCTION DETAILS

1.0 BANDING OF STAINLESS STEEL JACKET



Installation dimensions shown are minimum dimensions.

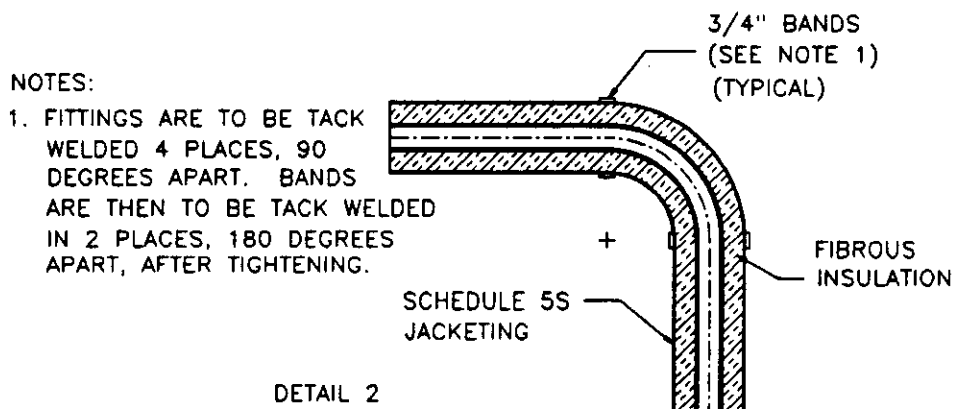
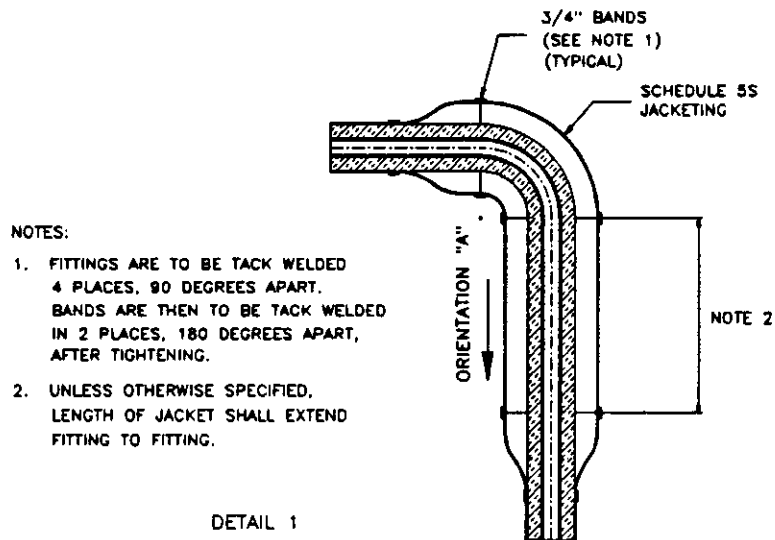
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## ATTACHMENT A (Continued)

### INSULATION CONSTRUCTION DETAILS

#### 2.0 Jacketing construction details for elbows.

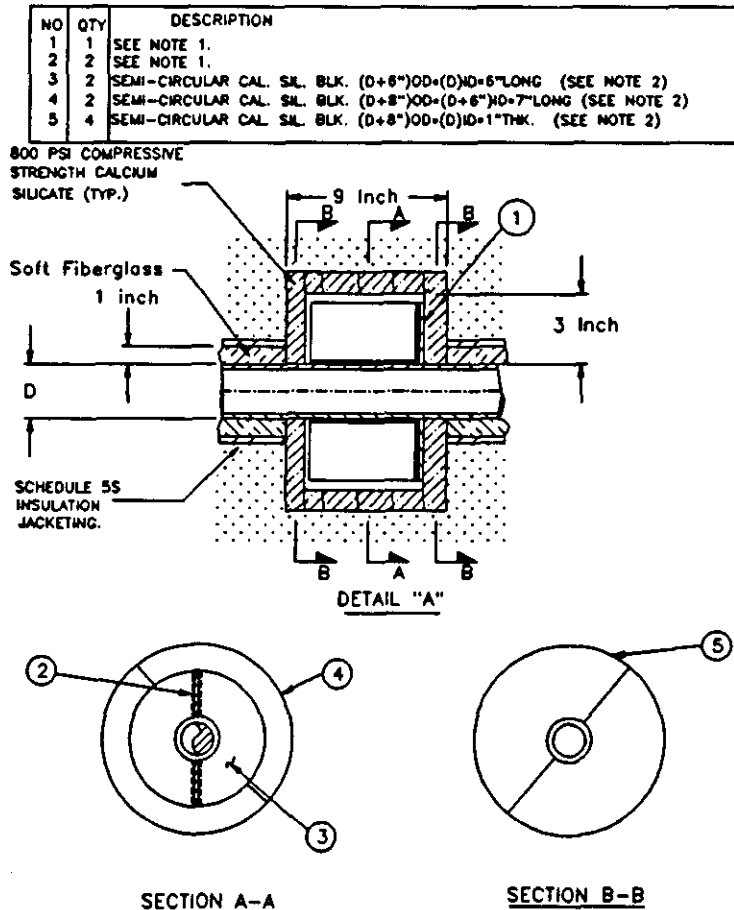


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## ATTACHMENT A (Continued)

### INSULATION CONSTRUCTION DETAILS

#### 3.0 Jacketing construction details for anchors.



#### NOTES:

1. STEEL PLATE PORTION OF ANCHOR IS SHOWN FOR REFERENCE ONLY. REFER TO DRAWING H-2-124091, SHEET 1.
2. INSULATION SHALL BE CALCIUM SILICATE WITH A COMPRESSIVE STRENGTH OF 800 PSI MINIMUM. ITEMS 3 AND 4 SHALL BE CUT AND/OR FABRICATED FROM MULTIPLE PANELS IF REQUIRED TO MAKE UP THE SPECIFIED LENGTH.
3. CALCIUM SILICATE DIMENSIONS SHOWN ARE NOMINAL, TO BE FIELD ADJUSTED TO PROVIDE SNUG ENOUGH FIT AROUND ANCHOR SUCH THAT MAXIMUM POSSIBLE LONGITUDINAL ANCHOR MOVEMENT IS LESS THAN 1/8".

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U.S. DEPARTMENT OF ENERGY  
Hanford Waste Vitrification Plant  
Richland, Washington  
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457

SECTION 15060  
PIPING MATERIAL, FABRICATION, ERECTION  
& PRESSURE TESTING (ALLOY PIPING)  
(B-595-C-B210A-15060)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
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WAPA YES    NO X  
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11/11/92  
Date

NOV 16 1992



SECTION 15060  
PIPING MATERIAL, FABRICATION, ERECTION  
& PRESSURE TESTING (ALLOY PIPING)  
(B-595-C-B210A-15060)

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**ATTACHMENTS**

<u>ATTACHMENT</u>	<u>TITLE</u>	<u>REV. NO.</u>
Attachment A	Cathodic Protection of Underground Lines	0
Attachment B	Piping Specialty Item List	B
Attachment C	Piping Abbreviation List	0

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**SECTION 15060**  
**PIPING MATERIAL, FABRICATION, ERECTION**  
**& PRESSURE TESTING (ALLOY PIPING)**  
**(B-595-C-B210A-15060)**

**PART 1 GENERAL**

**1.1 SUMMARY**

This specification defines the requirements for the purchasing, fabrication, installation, erection, testing and cleaning of alloy steel piping materials. Revision 0 of this Specification Section has been checked for completeness in regard to the Foundation Slab only.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**  
**AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**

ASME/ANSI B16.5                      1988 Pipe Flanges and Flanged Fittings

ASME/ANSI B16.9                      1986 Factory-Made Wrought Steel  
Buttwelding Fittings

ASME B31.1                            1989 Power Piping, Including Addenda a

ASME B31.3                            1990 Chemical Plant and Petroleum Refinery  
Piping, Including Addenda a & b

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A 193/A 193M                      1990 Alloy Steel and Stainless Steel  
Bolting Material for High-Temperature  
Service

ASTM A 194/A 194M                      1990 Carbon and Alloy Steel Nuts for Bolts  
for High-Pressure and High-Temperature  
Service

ASTM A 262                            1986 Detecting Susceptibility to  
Intergranular Attack in Austenitic  
Stainless Steels

ASTM A 269                            1990 Seamless and Welded Austenitic  
Stainless Steel Tubing for General Service

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ASTM A 312/A 312M	1991 Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 351/A 351M	1989 Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
ASTM A 403/A 403M	1991 Wrought Austenitic Stainless Steel Piping Fittings
ASTM B 366	1989 Factory-Made Wrought Nickel and Nickel Alloy Welding Fittings
ASTM B 619	1991 Welded Nickel and Nickel-Cobalt Alloy Pipe
ASTM B 622	1991 Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
ASTM G 28	1985 Detecting Susceptibility to Intergranular Attack in Wrought, Nickel-Rich Chromium-Bearing Alloys

#### AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C209	1990 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C214	1989 Tape Coating System for the Exterior of Steel Water Pipelines

#### PIPE FABRICATION INSTITUTE (PFI)

PFI ES-3	1990 Fabrication Tolerances
PFI ES-24	1990 Pipe Bending Methods, Tolerance, Process and Material Requirements
PFI ES-32	1985 Tool Calibration

### 1.3 RELATED REQUIREMENTS

Specification Section 05062	Welding Piping
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

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1.4 **DEFINITIONS**

The term "erection," where used in this specification, shall be defined as follows: Shop or field fabricated erection - the placing of any pipe or component of a piping or instrument system in its final position specified in the drawings and/or specifications.

1.5 **SYSTEM DESCRIPTION**

All components, fabrication, erection, and testing, except as otherwise qualified herein, shall be in accordance with the requirements of ASME B31.1 for steam and condensate systems, and ASME B31.3 for all other systems.

1.6 **SUBMITTALS**

Submit the following in accordance with Part III, Section 1, Exhibit 5 of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 **Shop Drawings**

Submit shop drawings of non-standard components per Paragraph 2.1.3A.

1.6.2 **Quality Control Submittals**

A. **Factory Acceptance Tests (FATS)**

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit corrosion test reports for each heat per Note 2 of Piping Material Class A3.

B. **Construction Acceptance Tests (CATS)**

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit Pressure Test Reports per Paragraph 3.3.4.
- 2) Submit cleaning reports per Paragraph 3.5.3.

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1.6.3 Certificates

Submit Certified Material Test Reports (CMTRs) for all pressure containing and/or wetted parts.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

2.1.1 Piping Material Classes

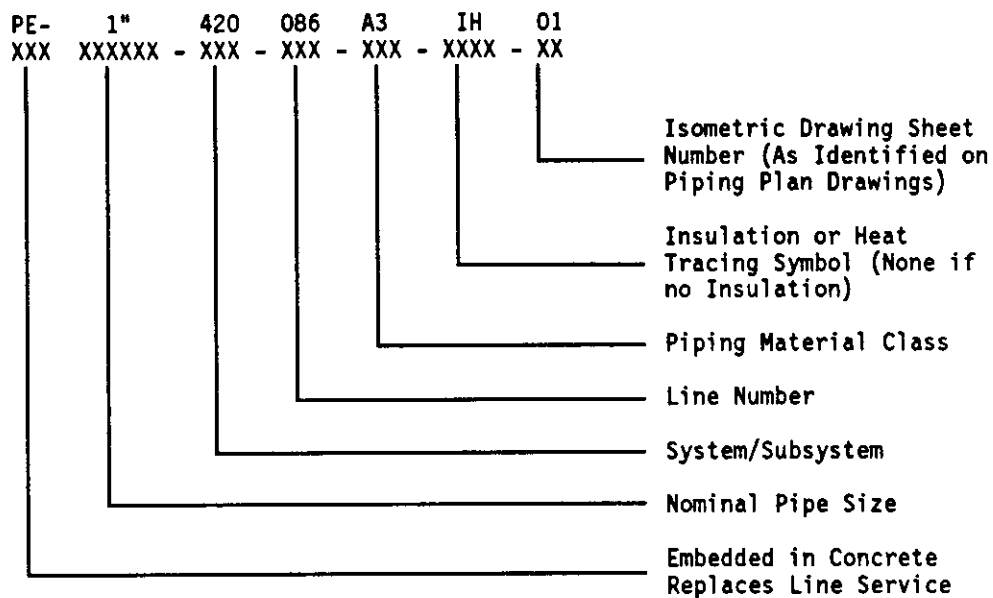
- A. Piping Material Classes are listed herein conform to designations as shown on the Drawings.
- B. Unless otherwise specified, all pressures and temperatures listed are design conditions.
- C. Piping Material Classes/Services Index

CLASS	MATERIAL	RATING CLASS	SERVICES	
A	304L Stainless Steel	150 BW	Instrument Air Regulated Drain Plant Air (Critical) Plant Air	Process Cooling Water Return Process Cooling Water Supply
A3	304L Stainless Steel	300 BW	Nitric Acid Decontamination Solution Process Condensate Process Steam	
K	Hastelloy C-22	150 BW	Sample Lines	

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#### D. Identification of Piping

Example:



9413202.075

## E. Piping Material Classes

### Piping Material Class A (See Note 3)

General Material: 304L Stainless Steel  
Rating: Class 150 RF  
Temperature Limit: -20°F through 450°F  
Maximum Pressure: Per ASME/ANSI B16.5  
Corrosion Allowance: .065"  
Construction: All Sizes Buttweld (except flanges at floor drain cleanouts)

ITEM	DESCRIPTION
------	-------------

#### Pipe

1/2" - 12" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.

#### Fittings (ells, tees, caps, and reducers)

1/2" - 12" Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, Schedule 40S (See Note 1).

#### Flanges (See Note 2)

1/2" - 12" Class 150 flat face slip-on type plate flange, 1/4" thick, ASME/ANSI B16.5 class 150 drilling, stainless steel ASTM A 240, Type 304L.

1/2" - 12" Class 150 flat face blind flange, 1/4" thick, ASME/ANSI B16.5 class 150 drilling, stainless steel ASTM A 240, Type 304L.

#### Gaskets (See Note 2)

1/2" - 12" Class 150, red rubber full face gasket, 1/8" thick, Sepco or equal.

#### Bolting

Stainless steel stud bolt, ASTM A 193/A 193M, Grade B8, class 2 with two stainless steel heavy hex nuts, ASTM A 194/A 194M, Grade 8S (Nitronic 60).

#### Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

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Piping Material Class A (continued)

Swages

1/2" - 2" Concentric swage, stainless steel ASTM A 403/A403M, Grade WP304L-S, schedule 40S, beveled both ends.

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Use for floor drain cleanouts only.
3. As an exception to the radiography (per Specification Section 05062) and pressure testing requirements for Piping Material Class "A", radiography and pressure testing will not be required for electrical penetrations. Electrical penetrations are identified as follows on the drawings:

System Number for the line will be 110, 120, 130, 14A, 14B, 15A, 15B, 15E, 15G, 16A, 16B, 170, 20A, 20B, 20C, 20D, 210, 220 or 230.

AND

Line Number will have a value between 900 and 999, inclusive.

EXAMPLE:

PE-2"-170-907-A

SYSTEM NUMBER      LINE NUMBER



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**Piping Material Class A3 (See Note 2)**

General Material: 304L Stainless Steel  
Rating: Class 300  
Temperature Limit: -20°F through 450°F  
Maximum Pressure: 260 PSIG  
Corrosion Allowance: .065" (See Note 3)  
Construction: All Sizes Buttweld

ITEM	DESCRIPTION
------	-------------

**Pipe**

1/2" - 4"	Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.
-----------	--

**Fittings (ells, tees, caps, and reducers)**

1/2" - 4"	Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, schedule 40S. (See Note 1)
-----------	---

**Branch Construction**

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

**Swages**

1/2" - 2"	Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP304L-S, schedule 40S, beveled both ends.
-----------	---

**Notes:**

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for all line sizes for jumpers; and for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. All piping material shall be corrosion tested per ASTM A 262, Practice A when used for nitric acid service as indicated on the pipe line list. One test shall be conducted per heat of material. The acceptance criteria shall be passing of Practice A of ASTM A 262, or a measured corrosion rate of less than 2 mils per month when tested per ASTM A 262, Practice C. A test report shall be submitted for each heat.
3. All embedded lines in acid service as indicated on the pipe line list have been checked to ensure an available corrosion allowance of 0.08 inch minimum. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of 0.08 inch if the line is in acid service.

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**Piping Material Class K (See Note 4)**

General Material: Hastelloy C-22  
Rating: Class 150  
Temperature Limit: -20°F through 400°F  
Maximum Pressure: per ASME/ANSI B16.5  
Corrosion Allowance: .065"  
Construction: All Sizes Buttweld/Flanged

ITEM	DESCRIPTION
------	-------------

Pipe

1/2" - 10"	Seamless Hastelloy C-22, schedule 40S, ASTM B 622, Alloy N06022, beveled ends (See Note 2).
------------	---

Fittings (ells, tees, caps, and reducers)

1/2" - 10"	Hastelloy C-22, buttweld type, schedule 40S, beveled ends, seamless to ASTM B 366, Grade WPHC22-S (See Notes 1 and 3).
------------	--

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Swages

1/2" - 10"	Concentric swage, Hastelloy C-22, schedule 40S, beveled both ends, seamless to ASTM B 366, Grade WPHC22-S (See Note 3).
------------	---

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for all line sizes for jumpers; and for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Pipe with a longitudinal weld seam in accordance with ASTM B 619, Alloy N06022 is an acceptable substitute provided the weld seam is radiographically examined in accordance with Paragraph 4.2.5 of ASTM B 366.
3. Fittings/swages with weld seams to ASTM B366, Grade WPHC22-WX are acceptable substitutions.
4. Certified Material Test Reports (CMTRs) for Hastelloy C-22 Material shall include certification that each heat has been tested per ASTM G 28, Practice A with a corrosion rate less than 6 mils per month, or ASTM G 28, Practice B, with a corrosion rate less than 2.3 mils per month.

9413202.0179

## 2.1.2 Pressure Testing Materials

### A. Test Water Requirements

Water used for cleaning and/or hydrotest shall conform to Specification Section 13252.

### B. Pneumatic Air Requirements

The air for pneumatic testing shall have a dew point of  $-20^{\circ}\text{F}$  or less at atmospheric pressure and shall contain less than 10 parts per million oil.

### C. Leak Detector Solution

Leak detector solution for pneumatic testing shall be Nupro "Snoop" or equal.

### D. Pressure Test Plugs

Open ends of piping systems (i.e., plain end or beveled end) that cannot otherwise be blanked off for pressure testing shall be closed off with commercial pressure test plugs suitable for the pipe size and test pressure.

## 2.1.3 Components

### General

The requirements contained in this Section shall apply to all Material Classes included in this specification.

- A. Pipe, fittings, flanges, and all other piping components (i.e., valves, strainers, gaskets, bolting, etc.) shall be standard components conforming to the standards listed in ASME B31.1, Appendix F for steam and condensate systems; and ASME B31.3, Appendix E, for all other systems within the size ranges of those codes. Where such conformance is not possible (i.e., fittings smaller than 1/2" nominal pipe size, manufacturer's proprietary design, etc.), the Seller shall submit a dimensional drawing of the component, and the component shall be certified by the manufacturer as being suitable for the design conditions of the applicable material class. The Seller shall adjust field dimensions if the materials procured do not correspond to the dimensions depicted on the drawings.
- B. Fittings shall conform to ASME/ANSI B16.9 (for butt weld fittings).

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#### 2.1.4 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 pounds per square inch lengthwise and 150 pounds per square inch crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be as specified in Table 1 and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 1

Red: Gas, Oil, Dangerous Materials

Blue: Water or Air Systems

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in the trench backfill.

2.1.5 See Attachment B for special piping components that are not specified in the Piping Material Classes.

## 2.2 FABRICATION AND MANUFACTURE

### 2.2.1 Shop Assembly

#### A. Welding

Welding and weld examination shall be in accordance with Specification Section 05062. All slip-on type flanges shall be double welded (Reference - ASME B31.3, Figure 328.5.2B).

#### B. Internal Misalignment

Where the ends of piping components are to be joined by welding and the internal surface misalignment exceeds the dimensional limits of the qualified welding procedure, one of the following procedures shall be used to correct this condition.

- 1) Taper bore or grind the wall of the component extending internally using a 4 to 1 maximum taper. Such tapering

shall not result in a finished wall thickness, before welding, that is less than the nominal pipe wall thickness minus the manufacturer's mill tolerance. Further reduction of the wall thickness requires Buyer's authorization.

- 2) Use spreaders or internal and/or external lineup clamps to correct moderate out-of-round condition.

C. Cleanliness

Cleanliness requirements for fabrication, handling and storage of 300 series stainless steel piping shall be per Specification Section 13252.

- D. Any deviations in dimensions from the drawings shall be submitted to the Buyer in writing, for approval, prior to fabrication of the affected piping.
- E. Dimensions on the Piping Plan drawings are in inches when dimensions are less than 1'-0". Feet and inches are shown when dimensions are 1'-0" and more. Dimensions on the Piping Isometric drawings are in inches when less than 2 feet. Feet and inches are shown when dimensions are 2 feet or greater.
- F. Dimensions are to the centerline of pipe.
- G. Where cold spring (CS) or prespring (PS) is required, the Piping drawings have been adjusted to accommodate this. The piping shall be fabricated to the dimensions shown.
- H. Reducers are concentric (except for slurry services) unless otherwise noted on the drawings.

2.2.2 Fabrication - Dimensional Tolerances

Pipe fabrication tolerances shall be in accordance with Pipe Fabrication Institute PFI ES-3.

2.2.3 Fabrication - Pipe Bending

- A. Fabrication involving the bending of pipe shall be done in accordance with Pipe Fabrication Institute PFI ES-24.
- B. When five diameter bends "5D" are referenced, they are to be fabricated in accordance with the 5D requirements. (The requirements for 5Dn are not to be applied under any circumstance.)

- C. The wall thickness after bending shall be not less than 87.5 percent of the initial wall thickness.

#### 2.2.4 Packaging and Shipping

- A. Preparation for shipment shall conform to the manufacturer's standard, and as a minimum shall provide protection against corrosion and damage from normal handling and storage.
- B. All pipe ends shall be protected by means of a plastic (non-PVC) or 300 series stainless steel plug or cap.

### PART 3 EXECUTION

### 3.1 PREPARATION

(Not Used)

### 3.2 INSTALLATION APPLICATION AND ERECTION

### 3.2.1 Field Fabrication and Erection

- A. All field fabrication shall conform to Paragraph 2.2 titled "Fabrication," except that field installation tolerances shall be plus or minus 1/2".
- B. All piping and tubing shall be fabricated and installed in accordance with the Piping drawings.
- C. Coordinates and elevations are used extensively on the Piping drawings. The Seller shall establish the required fabrication dimensions.
- D. Elevations are designated as follows:

Nonsloped lines -

"Bottom of Pipe" (BOP EL	_____
"Centerline Elevation" (CL EL	_____
"Beveled End Elevation" (BE EL	_____
"Plain End Elevation" (PE EL	_____

Sloped lines -  
"Centerline Work Point Elevation" (C.W.P. EL )

- E. Piping shall be examined before and after erection to ensure that all foreign matter has been removed from the exterior and interior surfaces.
- F. The Seller shall be responsible for the proper horizontal and vertical alignment of the piping as shown on the drawings.

- G. The Seller shall place buried warning and identification tape conforming to paragraph 2.1.4 to identify the presence of underground piping at a depth of 12 inches below finished grade or as shown on the Contract Drawings.
- H. Fitting make-up is not dimensioned on the drawings.
- I. Installation of temporary cathodic protection for metallic underground lines shall be in accordance with Attachment A, for underground lines which are to be buried by the Seller.

### 3.2.2 Coatings for Underground Piping

All single contained stainless steel piping in underground service shall be protected from exterior corrosion by use of a cold applied tape wrap. Materials, surface preparation, application and inspection requirements shall be in accordance with AWWA C209 and C214.

## 3.3 FIELD QUALITY CONTROL

### 3.3.1 Pressure Tests

- A. The minimum test pressure is the lowest allowable test pressure gauge reading (the calculated test pressure plus the additional pressure resulting from the static head of the test fluid above the test gauge).
- B. The maximum test pressure shall be the greater of:
  - 1) 1.1 times (1.1x) the minimum test pressure based on the applicable piping code.
  - 2) 60 psi greater than the minimum test pressure based on the applicable piping code.
- C. Prior to initial operation, all installed piping shall be tested except where otherwise qualified by this specification.
- D. Piping that is to be purged after installation shall be tested and all repairs made prior to purging.
- E. The Buyer's Representative shall be given two working days prior notification of the time and date of any testing to be performed.
- F. The Seller shall prepare and submit a hydrostatic and pneumatic test procedure, including test diagrams, and test report format.

### 3.3.2 Pressure Testing of Piping

- A. All pressure testing shall be per ASME B31.1 for steam and condensate systems; and ASME B31.3 for all other systems.

The alternate initial service tests as allowed in ASME B31.1 shall not be utilized.

- B. All piping systems shall be hydrostatically tested with the exception of the following systems (service to be identified on the pipe line list) which shall be pneumatic tested.

#### Service

Instrument Air (Cat I)  
Instrument Air

- C. As an exception to the paragraphs above, leak detection probe piping connected to the annular space of double wall sumps shall be tested with a pneumatic test of 0.5 to 1.0 pounds per square inch-gage. The maximum pressure test shall not be exceeded.

### 3.3.3 Pressure Test Preparation

- A. All joints, including welds, are to be left uninsulated and exposed for examination during the test. Joints may be insulated or coated once they have been previously tested in accordance with this specification.
- B. Pressure test gauges shall be calibrated per PFI ES-32. The calibration shall be made using a dead weight tester with calibration records traceable to the National Institute of Standards and Technology. Gauge shall be tagged with the dates of the last and next calibrations. The date of the gauge calibration shall be recorded by the seller.
- C. The Seller shall furnish the pumps, gauges, measuring devices, temporary plug valves, and other miscellaneous equipment necessary for testing.
- D. The test fluid media, pressure, minimum duration, and acceptance criteria shall be in accordance with the applicable code or standard referenced in Paragraph 3.3.2A. The following additional requirements shall be included:
- 1) The test pressure shall be applied and maintained for at least five minutes prior to start of minimum test duration to assure that the pressure has equalized.



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- 2) The test pressure shall be maintained for a time sufficient to examine all joints and connections for leakage, but in any case not less than ten minutes. The acceptance criteria is zero leakage.
- 3) If leaks are found, then
  - their locations shall be marked;
  - the test pressure shall be gradually released;
  - the piping shall be drained;
  - appropriate repairs or replacement shall be made;
  - and the pressure testing shall be repeated until acceptable results have been achieved.

#### 3.3.4 Test Records

- A. The Seller shall prepare and submit to the Buyer test reports for all piping systems requiring tests. The test reports shall contain, as a minimum, the following data:
  - 1) Job title and Contract Number
  - 2) Date of test
  - 3) Contract drawing and line numbers identification of piping systems
  - 4) Type of test, i.e., Hydrostatic, Pneumatic
  - 5) Pressure applied and length of time at Test pressure
  - 6) Test results
  - 7) Test by
  - 8) Signature of Seller Test Supervisor
  - 9) Comments, if any
  - 10) Gauge identification and dates of last and next calibration
  - 11) Signature or stamp of the Buyer's Representative

### 3.4 ADJUSTMENTS

(Not Used)

### 3.5 CLEANING

#### 3.5.1 Cleaning After Hydrotesting

A. After hydrostatic test, the following procedure shall be followed:

- 1) Water used in cleaning austenitic stainless steel and other alloy piping shall conform to Specification Section 13252.
- 2) Flushing velocity shall not exceed 10 feet per second but shall be a minimum of 4 feet per second.
- 3) Piping systems shall be flushed for a minimum of 10 minutes (continuous).
- 4) Visual examination of cleanliness shall be by visual examination of a clean white cloth used to filter the system discharge. Additional 10 minute flushes shall be performed until the visual examination reveals no visible debris collection on the cloth.
- 5) To ensure the absence of moisture after cleaning, lines shall be drained and blown dry. Drying procedure shall be per Specification Section 13252.
- 6) Immediately after cleaning, drying, and inspection, all non-flanged openings shall be tightly sealed with plastic (not PVC) caps to protect the bevel and pipe ends and to prevent the entry of moisture and foreign matter.

#### 3.5.2 Cleaning After Pneumatic Testing

After pneumatic testing, piping shall be purged at a minimum velocity of ten feet per second until no foreign matter is seen exiting the pipe. Air quality shall be that specified per paragraph 2.1.2.B of this specification.

#### 3.5.3 Cleaning Reports

All visual examinations, flushes, and purges shall be documented in a test report to be submitted to the Buyer.

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3.6      **PROTECTION**

(Not Used)

3.7      **DEMONSTRATION**

(Not Used)

3.8      **SCHEDULES**

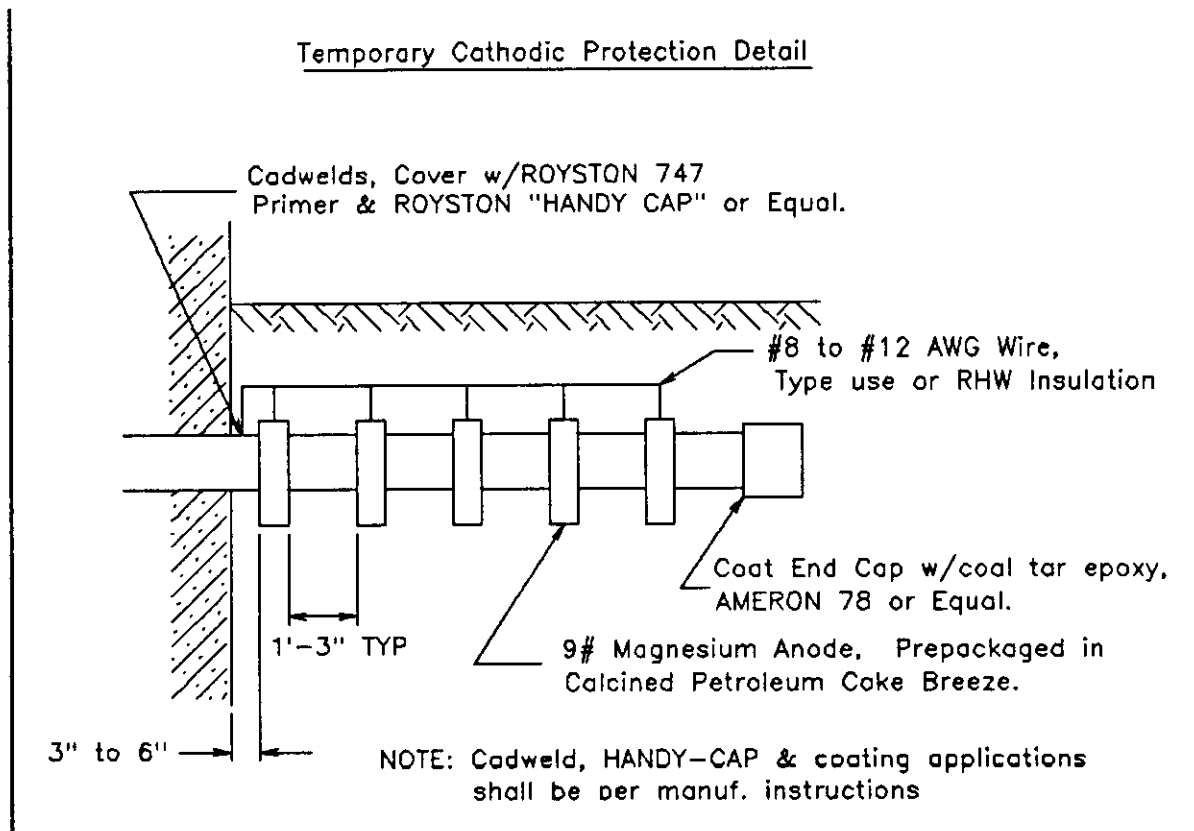
(Not Used)

**END OF SECTION**

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ATTACHMENT A  
CATHODIC PROTECTION OF UNDERGROUND PIPING



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ATTACHMENT B  
PIPING SPECIALTY ITEM LIST

SYSTEM NO. 21  
SHEET NO. 1 OF 1, REV. B

DATE 9/03/92 , BY CJI

SP/

THIS SYMBOL ON FLOW DIAGRAMS OR DRAWINGS DENOTES A PIPING  
SPECIALTY ITEM NOT OTHERWISE COVERED BY PIPING SPECIFICATIONS.

REV.	SP NUMBER	SIZE	FLOW DIAGRAM	LINE NUMBER	DESCRIPTION
B	21012	1"	H-2-123160-13		Window wash spray nozzles (TBD).


ATTACHMENT C

PIPING ABBREVIATION LIST

AFC	APPROVED FOR CONSTRUCTION	MIN	MINIMUM
APPV'D	APPROVED	MISC	MISCELLANEOUS
ATM	ATMOSPHERIC	N	NORTH
BE	BEVEL END	NO.	NUMBER
BLDG	BUILDING	NPS	NOMINAL PIPE SIZE
BW	BUTTWELD	NS	NOMINAL SIZE
CHK'D	CHECKED	N.S.	NOMINAL SIZE
CL	CLASS	OD	OUTSIDE DIAMETER
CONC	CONCENTRIC	OPER	OPERATING
CONFIG	CONFIGURATION	PE	PLAIN END
CONN.	CONNECTION	PDS	PLANT DESIGN SYSTEM
CONT.	CONTINUED	PLCS	PLACES
CR-MO	CHROME-MOLYBDENUM	PRESS	PRESSURE
CWBS	CONTRACT WORK BREAKDOWN STRUCTURE	PROJ	PROJECT
CWP	COLD WORKING PRESSURE	PSIG	POUNDS PER SQUARE INCH-GAGE
DBL	DOUBLE	PT	PART
DEG	DEGREE	P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
DES	DESIGN	QA	QUALITY ASSURANCE
DIA	DIAMETER	QTY	QUANTITY
DIR	DIRECTOR	RAD	RADIUS
DWG	DRAWING	REF	REFERENCE
ECC	ECCENTRIC	REG	REGULATED
EL	ELEVATION (HEIGHT)	REQD	REQUIRED
EL+	(POSITIVE HEIGHT)	REV	REVISION
ENGR.	ENGINEER	REV.	REVISION
ELL	ELBOW	R&C	REVIEW & COMMENT
ETC	ETCETERA	SCH	SCHEDULE
EXCA	EXCAVATION	SFTY	SAFETY CLASS
FALL	SLOPE	SH	SHEET
FLG	FLANGE	SMLS	SEAMLESS
FLR	FLOOR	STL	STEEL
FW	FIELD WELD	STRS	STRESS CHECK
HP	HIGH POINT	SVC	SERVICE
HPFS	HIGH POINT FINISHED SURFACE	SYS	SYSTEM
HORIZ	HORIZONTAL	SS	STAINLESS STEEL
ID	INSIDE DIAMETER	TEMP	TEMPERATURE
IE	FOR EXAMPLE	TEMP.	TEMPERATURE
INS	INCHES	THK	THICKNESS
INSUL	INSULATION	TYP	TYPICAL
ISO	ISOMETRIC	VERT	VERTICAL
LR	LONG RADIUS	VIT	VITRIFICATION
MAT'L	MATERIAL	VIT.	VITRIFICATION
MATL	MATERIAL	W	WEST
MGR	MANAGER	WN	WELD NECK

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ATTACHMENT C (Continued)

WP	WORK POINTW/ WITH	CL	CENTERLINE
	ANGLE DOWN	Ø	DIAMETER
&	AND	X°	DEGREE (ANGLE)
@	AT	X'	MINUTES OR FEET
°F	DEGREE(S) FAHRENHEIT	-	MINUS
		+	PLUS

U.S. DEPARTMENT OF ENERGY  
Hanford Waste Vitrification Plant  
Richland, Washington  
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457

SECTION 15062  
PIPING MATERIAL, FABRICATION, ERECTION  
& PRESSURE TESTING (DOUBLE CONTAINED PIPING)  
(B-595-C-B210A-15062)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 09 NOVEMBER 1992

WAPA YES      NO X  
QUALITY LEVEL I      II X  
SAFETY CLASS 1      2      3 X 4     

ORIGINATOR(S):

CHECKER(S):

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Ken Baughman Lead Discipline Engineer (Date)

NOV 16 1992



**SECTION 15062**  
**PIPING MATERIAL, FABRICATION, ERECTION**  
**& PRESSURE TESTING (DOUBLE CONTAINED PIPING)**

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**SECTION 15062  
PIPING MATERIAL, FABRICATION, ERECTION  
& PRESSURE TESTING (DOUBLE CONTAINED PIPING)**

**PART 1 GENERAL**

**1.1 SUMMARY**

This Section defines the technical requirements for the furnishing, fabrication, erection and testing of Double Contained Piping. Revision 0 of this Specification Section has been checked for completeness in regard to the Foundation Slab only.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)  
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**

ASME/ANSI B16.9                      1986 Factory-Made Wrought Steel  
Buttwelding Fittings

ASME B31.3                          1990 Chemical Plant and  
Petroleum Refinery Piping,  
Including Addenda a and b

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A 182/A 182M                  1990 Forged or Rolled Alloy-  
Steel Pipe Flanges, Forged  
Fittings, and Valves and Parts  
for High-Temperature Service

ASTM A 234/A 234M                  1990 Piping Fittings of Wrought  
Carbon Steel and Alloy Steel  
for Moderate and Elevated  
Temperatures

ASTM A 240                          1991 Heat-Resisting Chromium  
and Chromium- Nickel Stainless  
Steel Plate, Sheet, and Strip  
for Pressure Vessels

ASTM A 262                          1986 Detecting Susceptibility  
to Intergranular Attack in  
Austenitic Stainless Steels

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ASTM A 312/A 312M                      1991 Seamless and Welded  
Austenitic Stainless Steel  
Pipes

ASTM A 403/A 403M                      1991 Wrought Austenitic  
Stainless Steel Piping Fittings

PIPE FABRICATION INSTITUTE (PFI)

PFI Standard ES-3                      1990 Fabricating Tolerances

PFI Standard ES-24                      1990 Pipe Bending Methods,  
Tolerances, Process and  
Material Requirements

PFI Standard ES-32                      1985 Tool Calibration

1.3                      **RELATED REQUIREMENTS**

This specification is to be used in conjunction with the following specifications:

Specification Section 05062              Welding Piping

Specification Section 13252              Precautions for Fabrication,  
Handling and Storage of  
Stainless Steel and Nickel  
Alloys

Specification Section 15060              Piping Material, Fabrication,  
Erection & Pressure Testing  
(Alloy Piping)

1.4                      **DEFINITIONS**

The term "erection," where used in this specification, shall be defined as follows: Shop or field fabricated erection - the placing of any pipe or component of a piping or instrument system in its final position specified in the drawings and/or specifications.

1.5                      **SYSTEM DESCRIPTION**

All components, fabrication, erection, and testing, except as otherwise qualified herein, shall be in accordance with the requirements of ASME B31.3.

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1.6 SUBMITTALS

Submit the following in accordance with Part III, Section I, Exhibit 5 of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 Shop Drawings

Submit shop drawings of nonstandard components per Paragraph 2.1.3A.

1.6.2 Quality Control Submittals

A. Factory Acceptance Tests (FATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit corrosion test reports for each heat per Note 2 of Piping Material Classes DD and DE.

B. Construction Acceptance Tests (CATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit Pressure Test Reports per Paragraph 3.3.4.
- 2) Submit cleaning reports per Paragraph 3.5.3.

1.6.3 Certificates

Certified Material Test Reports (CMTRs) for all pressure containing and/or wetted parts.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

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## PART 2 PRODUCTS

### 2.1 MATERIALS/EQUIPMENT

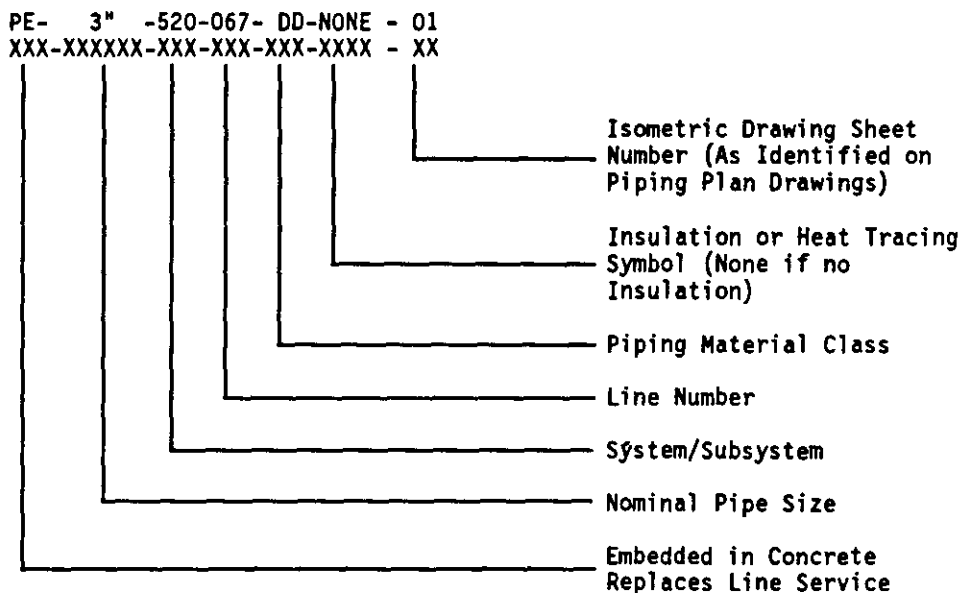
#### 2.1.1 Piping Material Classes

- A. Piping Material Classes are listed herein conform to designations as shown on the drawings.
- B. Unless otherwise specified, all pressures and temperatures listed are design conditions.
- C. Piping Material Classes/Services Index

CLASS	MATERIAL	RATING CLASS	SERVICE
DD	Carrier - 304L SS Containment - 304L SS	300 300	Regulated Drains
DE	Carrier - 316L SS Containment - 316L SS	300 300	Regulated Drains (Formic Acid Drains)

#### D. Identification of Piping

Example:



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### Piping Material Class DD

General Material: Carrier and Containment - 304L Stainless Steel  
Rating: Carrier - Class 300  
Containment - Class 300  
Temperature Limit: -20°F thru 450°F  
Maximum Pressure: 260 PSIG  
Corrosion Allowance: Carrier - .065" (See Note 3)  
Containment - None  
Construction: Carrier and Containment - Buttweld (except socketweld connections to containment drains)

#### ITEM DESCRIPTION

##### Carrier and Containment Pipe (See Note 2)

2" - 8" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.

##### Carrier and Containment Fittings (ells, tees, laterals, caps, and reducers, See Notes 1 and 2)

2" - 8" Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, schedule 40S.

##### Containment Self Reinforced Branch Connections

1/2" - 2" Class 3000 stainless steel, ASTM A 182/A 182M, Grade F304L, socketweld. Bonney Forge Sockolet or equal.

##### Carrier Branch Construction

Use reducing tees or reducing laterals within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

##### Containment Branch Construction

Use reducing tees or reducing laterals (split and reweld to suit) within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals (split and reweld to suit) and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

##### Carrier Swages

2" - 2" Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP304L-S, schedule 40S, beveled both ends.

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## Piping Material Class DD (continued)

### Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 304L stainless steel plate.

#### Notes:

1. Use bends with a radius of 3 nominal pipe diameters (3D) on carrier piping for sizes 2", and fittings on containment piping except where indicated otherwise on the drawings.
2. All carrier piping material shall be corrosion tested per ASTM A 262, Practice A. One test shall be conducted per heat of material. The acceptance criteria shall be passing of Practice A of ASTM A 262, or a measured corrosion rate of less than 2 mils per month per ASTM A 262, Practice C. A test report shall be submitted for each heat.
3. All embedded lines have been checked to ensure an available corrosion allowance of .120 inch minimum on the carrier pipe. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of .120 inch on the carrier pipe.

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### Piping Material Class DE

General Material: Carrier and Containment - 316L Stainless Steel  
Rating: Carrier - Class 300  
Containment - Class 300  
Temperature Limit: -20°F thru 450°F  
Maximum Pressure: 260 PSIG  
Corrosion Allowance: Carrier - .065" (See Note 3)  
Containment - None  
Construction: Carrier and Containment - Buttweld (except socketweld connections to containment drains)

#### ITEM DESCRIPTION

Carrier and Containment Pipe (See Note 2)

2" - 8" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP316L, beveled ends.

Carrier and Containment Fittings (ells, tees, caps, and reducers, See Notes 1 and 2)

2" - 8" Stainless steel, ASTM A 403/A 403M, Grade WP316L-S, buttweld type, schedule 40S.

Containment Self Reinforced  
Branch Connections

1/2" - 2" Class 3000 stainless steel, ASTM A 182/A 182M, Grade F316L, socketweld. Bonney Forge Sockolet or equal.

Carrier Branch Construction

Use reducing tees or reducing laterals within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Containment Branch Construction

Use reducing tees or reducing laterals (split and reweld to suit) within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals (split and reweld to suit) and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Carrier Swages

2" - 2" Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP316L-S, schedule 40S, beveled both ends.



Piping Material Class DE (continued)

Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 316L stainless steel plate.

Notes:

1. Use bends with a radius of 3 nominal pipe diameters (3D) on carrier piping for size 2", and fittings on containment piping except where indicated otherwise on the drawings.
2. All carrier piping material shall be corrosion tested per ASTM A 262, Practice A. One test shall be conducted per heat of material. The acceptance criteria shall be passing of Practice A of ASTM A 262, Practice A, or a measured corrosion rate of less than 4 mils per month per ASTM A 262, Practice B. A test report shall be submitted for each heat.
3. All embedded lines have been checked to ensure an available corrosion allowance of .120 inch minimum on carrier piping. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of .120 inch on carrier piping.

## 2.1.2 Pressure Testing Materials

### A. Test Water Requirements

Water used for cleaning and/or hydrotest shall conform to Specification Section 13252.

### B. Pneumatic Air Requirements

The air for pneumatic testing shall have a dew point of -20°F or less at atmospheric pressure and shall contain less than 10 parts per million oil.

### C. Leak Detector Solution

Leak detector solution for pneumatic testing shall be Nupro "Snoop" or equal.

### D. Pressure Test Blinds

Plain 1/4" thick stainless steel test blanks made from ASTM A 240, Grade TP304 plate with 1/16 inch thick non-asbestos gaskets shall be used for blanking raised face flanges for sizes up to 6 inches.

### E. Pressure Test Plugs

Open ends of piping systems (i.e., plain end or beveled end) that cannot otherwise be blanked off for pressure testing shall be closed off with commercial pressure test plugs suitable for the pipe size and test pressure.

## 2.1.3 Components

### General

The requirements contained in this Section shall apply to all Material Classes included in this specification.

- A. Pipe, fittings, and all other piping components (i.e., valves, strainers, gaskets, bolting, etc.) shall be standard components conforming to the standards listed in ASME B31.3, Appendix E within the size ranges of those standards. Where such conformance is not possible (i.e., fittings smaller than 1/2" NPS, manufacturer's proprietary design, etc.), the Seller shall submit a dimensional drawing of the component, and the component shall be certified by the manufacturer as being suitable for the design conditions of the applicable material class. The Seller shall adjust field dimensions if the materials procured do not correspond to the dimensions depicted on the drawings.

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2.1.4 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 pounds per square inch lengthwise and 150 pounds per square inch crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be as specified in Table 1 and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 1

TAPE COLOR

Red: Gas, Oil, Dangerous Materials

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in the trench backfill.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Shop Assembly

A. Welding

Welding, weld examination and postweld heat treatment shall be in accordance with Specification Section 05062.

B. Internal Misalignment

Where the ends of piping components are to be joined by welding and the internal surface misalignment exceeds the dimensional limits of the qualified welding procedure, one of the following procedures shall be used to correct this condition.

- 1) Taper bore or grind the wall of the component extending internally using a 4 to 1 maximum taper. Such tapering shall not result in a finished wall thickness, before welding, that is less than the nominal pipe wall thickness minus the manufacturer's mill tolerance. Further reduction of the wall thickness requires Buyer's authorization.

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- 2) Use spreaders or internal and/or external lineup clamps to correct moderate out-of-round condition.

C. Cleanliness

Cleanliness requirements for fabrication, handling and storage of 300 series stainless steel piping shall be per Specification Section 13252.

- D. Any deviations in dimensions from the drawings shall be submitted to the Buyer in writing, for approval, prior to fabrication of the affected piping.
- E. Dimensions on the Piping Plan drawings are in inches when dimensions are less than 1'-0". Feet and inches are shown when dimensions are 1'-0" and more. Dimensions on the Piping Isometric drawings are in inches when less than 2 feet. Feet and inches are shown when dimensions are 2 feet or greater.
- F. Dimensions are to the centerline of pipe.
- G. Where cold spring (CS) or prespring (PS) is required, the Piping drawings have been adjusted to accommodate this. The piping shall be fabricated to the dimensions shown.
- H. Reducers are concentric (except for slurry services) unless otherwise noted on the drawings.

2.2.2 Fabrication - Dimensional Tolerances

Pipe bend fabrication shall be in accordance with Pipe Fabrication Institute ES-3.

2.2.3 Fabrication - Pipe Bending

- A. Pipe bending shall be in accordance with Pipe Fabrication Institute ES-24. Except, pipe bend post wall thickness shall be no less than 78.1 percent of the pre-bend thickness.
- B. When three diameter bends "3D" are referenced, they are to be fabricated in accordance with the 3D requirements. (The requirements for 3Dn are not to be applied under any circumstance.)

2.2.4 Packaging and Shipping

- A. Preparation for shipment shall conform to the manufacturer's standard, and as a minimum shall provide protection against corrosion and damage from normal handling and storage.

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B. Minimum preparation shall include the following:

All pipe ends shall be protected by means of a plastic (non-PVC) or 300 series stainless steel plug or cap.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION APPLICATION AND ERECTION

3.2.1 Field Fabrication and Erection

- A. All field fabrication shall conform to the paragraph titled "Fabrication", except that field installation tolerances shall be plus or minus 1/2".
- B. All piping and tubing shall be fabricated and installed in accordance with the Piping drawings.
- C. Coordinates and elevations are used extensively on the Piping drawings. The Seller shall establish the required fabrication dimensions.
- D. Elevations are designated as follows:
- |                   |  |
|-------------------|--|
| Nonsloped lines - | "Bottom of Pipe" (BOP EL _____)                      |
|                   | "Centerline Elevation" (CL EL _____)                 |
|                   | "Beveled End Elevation" (BE EL _____)                |
|                   | "Plain End Elevation" (PE EL _____)                  |
| Sloped lines -    | "Centerline Work Point Elevation" (CL W.P. EL _____) |
- E. Piping shall be examined before erection to ensure that all foreign matter has been removed.
- F. The Seller shall be responsible for the proper horizontal and vertical alignment of the piping as shown on the drawings.
- G. The Seller may elect, at his option, to split and reweld secondary containment piping, fittings, anchors, etc.
- H. The Seller shall place buried warning and identification tape conforming to Paragraph 2.1.4 to identify the presence of underground piping at a depth of 12 inches below finished grade or as shown on the Contract Drawings.

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- I. Fitting make-up is not dimensioned on the drawings.
- J. Installation of temporary cathodic protection for metallic underground lines shall be in accordance with Attachment A of Specification Section 15060, for underground lines which are to be buried by the Seller.

### 3.2.2 Coatings for Underground Piping

All exposed piping (including stainless steel containment pipe) in underground service shall be protected from exterior corrosion by use of a cold applied tape wrap. Materials, surface preparation, application and inspection requirements shall be in accordance with manufacturer's recommendations. Use "KNIGHT/LAGGI" HI-TEMP tape or approved equal.

## 3.3 FIELD QUALITY CONTROL

### 3.3.1 Pressure Tests

- A. The minimum test pressure is the lowest allowable test pressure gauge reading (the calculated test pressure plus the additional pressure resulting from the static head of the test fluid above the test gauge).
- B. The maximum test pressure shall be the greater of:
  - 1) 1.1 times (1.1x) the minimum test pressure
  - 2) 60 psi greater than the minimum test pressure
- C. Prior to initial operation, all installed piping shall be tested except where otherwise qualified by this specification.
- D. Piping that is to be purged after installation shall be tested and all repairs made prior to purging.
- E. The Buyer's Representative shall be given two working days prior notification of the time and date of any testing to be performed.
- F. The Seller shall prepare and submit a hydrostatic and pneumatic test procedure, including test diagrams, and test report format.

### 3.3.2 Pressure Testing of Piping

- A. All pressure testing shall be per ASME B31.3.

- B. All piping systems shall be hydrostatically tested (carrier piping).
- C. The annular space of double contained pipe shall be pneumatically tested with air at 10 psig, meeting the requirements of paragraph 2.1.2.B of this specification.

### 3.3.3 Pressure Test Preparation

- A. All joints, including welds, are to be left uninsulated and exposed for examination during the test. Joints may be insulated or coated once they have been previously tested in accordance with this specification.
- B. Pressure test gauges shall be calibrated per PFI ES-32. The calibration shall be made using a dead weight tester with calibration records traceable to the National Institute of Standards and Technology. Gauge shall be tagged with the dates of the last and next calibrations. The date of the gauge calibration shall be recorded by the Seller.
- C. The Seller shall furnish the pumps, gauges, measuring devices, temporary plug valves, and other miscellaneous equipment necessary for testing.
- D. The test fluid media, pressure, minimum duration, and acceptance criteria shall be in accordance ASME B31.3. The following additional requirements shall be included:
  - 1) The test pressure shall be applied and maintained for at least five minutes prior to start of minimum test duration to assure that the pressure has equalized.
  - 2) The test pressure shall be maintained for a time sufficient to examine all joints and connections for leakage, but in any case not less than ten minutes. The acceptance criteria is zero leakage.
  - 3) If leaks are found, then
    - their locations shall be marked;
    - the test pressure shall be gradually released;
    - the piping shall be drained;
    - appropriate repairs or replacement shall be made;
    - and the pressure testing shall be repeated until acceptable results have been achieved.

3.3.4 Test Records

A. The Seller shall prepare and submit to the Buyer test reports for all piping systems requiring tests. The test reports shall contain, as a minimum, the following data:

- 1) Job title and Contract Number
- 2) Date of test
- 3) Contract drawing and line numbers identification of piping systems
- 4) Type of test, i.e., Hydrostatic, Pneumatic,
- 5) Pressure applied and length of time at Test pressure
- 6) Test results
- 7) Test by
- 8) Signature of Seller Test Supervisor
- 9) Comments, if any
- 10) Gauge identification and dates of last and next calibration
- 11) Signature or stamp of the Buyer's Representative

3.4 ADJUSTMENT

(Not Used)

3.5 CLEANING

3.5.1 Cleaning After Hydrotesting

A. After hydrotesting, the following procedure shall be followed:

- 1) Water used in cleaning austenitic stainless steel and other alloy piping shall conform to Specification Section 13252.
- 2) Flushing velocity shall not exceed 10 feet per second but shall be a minimum of 4 feet per second.
- 3) Piping systems shall be flushed for a minimum of 10 minutes (continuous).

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- 4) Visual examination of cleanliness shall be by visual examination of a clean white cloth used to filter the system discharge. Additional 10 minute flushes shall be performed until the visual examination reveals no visible debris collection on the cloth.
- 5) To ensure the absence of moisture after cleaning, lines shall be drained and blown dry. The drying procedure shall be per Specification 13252.
- 6) Immediately after cleaning, drying, and inspection, all non-flanged openings shall be tightly sealed with polyethylene caps to protect the bevel and pipe ends and to prevent the entry of moisture and foreign matter.

#### 3.5.2 Cleaning After Pneumatic Testing

After pneumatic testing, piping shall be purged at a minimum velocity of ten feet per second until no foreign matter is seen exiting the pipe. Air quality shall be that specified per paragraph 2.1.2.B of this specification.

#### 3.5.3 Cleaning Reports

All visual examinations, flushes, and purges shall be documented in a test report to be submitted to the Buyer.

#### 3.6 PROTECTION

(Not Used)

#### 3.7 DEMONSTRATION

(Not Used)

#### 3.8 SCHEDULE

(Not Used)

END OF SECTION

SECTION 16100  
ELECTRICAL INSTALLATION  
(B-595-C-B210A-16100)

"APPROVED FOR CONSTRUCTION"

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WAPA	YES	<u>    </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>    </u>	II	<u>X</u>
SAFETY CLASS	1	<u>    </u>	2	<u>    </u>
	3	<u>    </u>	4	<u>X</u>

ORIGINATOR:

CHECKER:

Charles Simpson 11-11-92  
C. C. Simpson, Electrical Engineer Date

K. K. Srivastava 11/12/92  
K. K. Srivastava, Electrical Engr. Date

APPROVED BY:

K. A. Owrey  
K. A. Owrey Lead Discipline Engineer

11-12-92  
Date

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SECTION 16100  
ELECTRICAL INSTALLATION

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**SECTION 16100  
ELECTRICAL INSTALLATION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- 1.1.1 This specification defines the technical requirements for installation of electrical materials and devices in the Vitrification Building foundation.
- 1.1.2 Seller shall furnish all labor, material, tools, and equipment necessary to perform installation of wall embedments, underground duct banks and grounding system for the Vitrification Building foundation package as shown on the Contract Drawings and in accordance with the requirements of this section.
- 1.1.3 Seller shall be responsible for electrical installation and field routing of conduit and grounding system where not specifically defined on the Contract Drawings.
- 1.1.4 Seller shall provide and install locknuts, union fittings, caps, plugs, and hardware, etc., as required to complete the installation per the Contract Drawings.
- 1.1.5 Dimensional tolerance shall be  $\pm 1$  inch unless otherwise specified on the Contract Drawings.

**1.2 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

NFPA 70                      1990 National Electrical Code (NEC)

**1.3 RELATED REQUIREMENTS**

Specification Section 16110    Electrical Materials and Devices

Specification Section 16111    Conduit Schedule

Specification Section 16905    Electrical Testing

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1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

1.6.1 Submit the following in accordance with the Vendor Drawing and Data Requirements section of the subcontract.

A. As-Built Drawings

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

**PART 2 PRODUCTS**

2.1 **MATERIALS AND EQUIPMENT**

2.1.1 Seller shall install all materials including grounding system, underground duct banks, wall embeds and conduit stub-ups required to complete electrical installation in accordance with the Contract Drawings and specification sections.

2.1.2 Electrical material and devices shall be in accordance with Specification Section 16110, Electrical Materials and Devices.

2.2 **FABRICATION AND MANUFACTURE**

(Not Used)

### PART 3 EXECUTION

#### 3.1 INSTALLATION, APPLICATION AND ERECTION

- 3.1.1 Materials and devices shall be installed in accordance with NFPA 70, the Contract Drawings and manufacturer's instructions.
- 3.1.2 Conduit
- 3.1.2.1 Conduits installed below grade shall be polyvinyl chloride (PVC) Schedule 80 or rigid steel galvanized conduit as noted on the Contract Drawings.
- 3.1.2.2 Rigid steel galvanized conduit shall be cut square with a conduit cutter and threaded with a conduit threader. The ends shall be reamed of burrs and all metal shavings and cutting lubricants shall be removed before the conduit is connected to the conduit system.
- 3.1.2.3 Stainless steel conduits shall be cut square with a conduit cutter.
- 3.1.2.4 Electrical embeds shall be stainless steel conduit.
- 3.1.2.5 Conduit crushed or deformed in bending will be rejected. Concentric bends are not required; however, the Seller shall maintain identical spacing between adjacent conduit runs both at the beginning and after the bend.
- 3.1.2.6 Supports shall be erected square, and true to line and grade, with a minimum spacing of one support for every 10 feet of conduit length.
- 3.1.2.7 Conduit openings into which dirt, mortar mix or debris may fall shall be closed with caps or plugs during the construction period. Conduits in which such material has accumulated shall be thoroughly cleaned. Where such accumulations cannot be readily removed, the conduit shall be replaced.
- 3.1.2.8 When not shown in detail on the Contract Drawings or when an installation interference exists, the exact locations and routing of conduit shall be determined by the Seller and approved by the Buyer.
- 3.1.2.9 Fittings on conduit systems having threaded connections shall be made up tight, with full thread engagement, and with a minimum of wrench work in order to avoid wrench cuts. Running threads and slip joints are not permitted. Joints shall provide structural rigidity and low electrical resistance.

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- 3.1.2.10 Before making up conduit runs, the interiors of all conduit, conduit bends and fittings shall be inspected and cleaned of all dirt, cuttings and other foreign material.
  - 3.1.2.11 Conduit threads shall be continuous and shall be made with appropriate tooling.
  - 3.1.2.12 Rigid steel field cut threads shall have anti-siege compound. The application of the coating shall overlap the unthreaded conduit by one inch all around.
  - 3.1.3 Conduit and Hardware Supports
    - 3.1.3.1 Conduit supports shall be furnished and installed by the Seller as required by National Electrical Code and as shown on the Contract Drawings.
  - 3.1.4 Identification
    - 3.1.4.1 Conduits
      - 3.1.4.1.1 Embeds and conduits listed on Specification Section 16111, Conduit Schedule, shall be identified in accordance with Specification Section 16110.
      - 3.1.4.1.2 Embeds shall be identified at both sides of any walls. Conduit stub-ups/stub-outs shall be identified as shown on the Contract Drawings.
  - 3.1.5 Grounding
    - 3.1.5.1 The grounding system including underground duct banks, railroad track rails, ground rods, embedded ground plates, etc., shall be in accordance with the Contract Drawings. In addition to the grounding specified herein or on the Contract Drawings, all ground connections required by the National Electrical Code shall be furnished and installed.
    - 3.1.5.2 Grounding conductor shall be copper except for ground grid external to the buildings which shall be low carbon grade steel. Routing shall be as shown on the Contract Drawings.
    - 3.1.5.3 Before connections are made, all contact surfaces shall be clean of grease, dirt and debris. Apply approved anti-oxidizing compound as specified in Section 16110 to clean contact surfaces connections.
    - 3.1.5.4 All exothermic weld connections shall be made by the Cadweld process or equal. Grounding connections shall include but not be limited to, all cable to cable splices, tees, X's, cable to ground

rods, copper to steel or cast iron and cable lug terminations as shown on the Contract Drawings.

- 3.1.5.5 Building rebar shall be grounded as shown on the Contract Drawings.
- 3.1.5.6 Ground connections to railroad track rails shall be made with exothermic connection, Cadweld Type W connection or equal as shown on the Contract Drawings.
- 3.1.6 Underground Duct Banks
  - 3.1.6.1 Underground duct banks shall consist of rigid steel galvanized conduit, PVC conduit and ground wire encased in concrete as shown on the Contract Drawings. Joints in conduit shall be water-tight.
  - 3.1.6.2 Minimum depth to top of duct banks shall be 2'-6" except as noted on the Contract Drawings.
  - 3.1.6.3 After underground conduit runs have been completed, pull a test mandrel and wire brush through each conduit to check alignment and remove foreign matter.

### 3.2 FIELD QUALITY CONTROL

Electrical materials and devices shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

### 3.3 ADJUSTMENTS

(Not Used)

### 3.4 CLEANING

- 3.4.1 Clean and remove all debris, excess material and equipment from the job site after completion of installation.
- 3.4.2 Clean electrical parts with approved cleaner to remove conductive and deleterious materials.
- 3.4.3 Clean and repair all steel surfaces damaged during preparation, welding or installation with an approved galvanizing compound in accordance with manufacturer's recommendations and instructions.



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3.5        **PROTECTION**

3.5.1      Seller shall be responsible for receiving, storing and site handling of all Seller furnished equipment and materials.

3.5.2      During installation Seller shall protect from damage all existing facilities, equipment and materials. Existing facilities, equipment or materials which are damaged during the installation shall be repaired at Seller's expense in accordance with contract terms and conditions.

3.6        **DEMONSTRATION**

(Not Used)

3.7        **SCHEDULES**

(Not Used)

**END OF SECTION**

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SECTION 16110  
ELECTRICAL MATERIALS AND DEVICES  
(B-595-C-B210A-16110)

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SAFETY CLASS 1     2     3     4 X

ORIGINATOR:

Charles Simpson 11-11-92  
C. C. Simpson, Electrical Engineer Date

CHECKER:

K. K. Srivastava 11/12/92  
K. K. Srivastava, Electrical Engr. Date

APPROVED BY:

K. A. Owrey  
K. A. Owrey Lead Discipline Engineer

11-12-92  
Date

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SECTION 16110  
ELECTRICAL MATERIALS AND DEVICES

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**SECTION 16110**  
**ELECTRICAL MATERIALS AND DEVICES**

**PART 1 GENERAL**

**1.1 SUMMARY**

This specification section defines the technical requirements for furnishing and delivery of electrical materials and devices for the Vitrification Building foundation.

**1.2 REFERENCES**

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**

ANSI C80.1                      1990 Rigid Steel Conduit

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A312/A312M              1991 Standard Specification for Seamless  
and Welded Austenitic Stainless Steel  
Pipes

ASTM A403/A403M              1991 Standard Specification for Wrought  
Austenitic Stainless Steel Pipe Fittings

ASTM A475                      1989 Standard Specification for Zinc-  
Coated Steel Wire Strand

ASTM B3                        1990 Standard Specification for Soft or  
Annealed Copper Wire

ASTM B8                        1990 Standard Specification for  
Concentric-Lay-Standard Copper  
Conductors, Hard, Medium-Hard or Soft

**UNDERWRITERS LABORATORIES, INC. (UL)**

UL 467                        1984 Grounding and Bonding Equipment

UL 514B                       1989 Fittings for Conduit and Outlet  
Boxes

UL 651                        1989 Schedule 40 and 80 Rigid PVC Conduit

**1.3 RELATED REQUIREMENTS**

Specification Section 16100 Electrical Installation  
Specification Section 16111 Conduit Schedule  
Specification Section 16905 Electrical Testing

**1.4 DEFINITIONS**

(Not Used)

**1.5 SYSTEM DESCRIPTION**

(Not Used)

**1.6 SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

**1.6.1 Catalog and Manufacturer's Data**

Catalog and manufacturer's data shall be submitted for the following:

- A. Conduit
- B. Conduit fittings
- C. Conduit support devices and hardware
- D. Identification
- E. Grounding materials
- F. Conduit anti-seize compounds
- G. Anti-oxidizing compound
- H. Galvanizing touch-up material

**1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

**1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

**1.8.1 Climatic and Geographic Site Conditions**

- A. Site Elevation 714 feet above sea level

- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
  - 1) Maximum Design Temperature 110°F
  - 2) Minimum Design Temperature -20°F

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 General

2.1.1.1 When applicable, all electrical materials and components shall be listed by Underwriter's Laboratories and shall bear the UL label.

2.1.1.2 When two or more components of the same specifications are required, the components shall be identical, that is same manufacturer and catalog number.

#### 2.1.2 Conduit

##### 2.1.2.1 Rigid Steel Conduit

Rigid steel conduit shall be in accordance with ANSI C80.1.

##### 2.1.2.2 PVC Conduit

PVC conduit shall be Schedule 80 in accordance with UL 651.

##### 2.1.2.3 Stainless Steel Conduit

2.1.2.3.1 Austenitic seamless stainless steel conduit shall be Type 304L Schedule 40 in accordance with ASTM A312/A312M.

#### 2.1.3 Conduit Fittings

2.1.3.1 Stainless steel conduit ends shall be protected by means of a plastic or 300 series stainless plug or cap.

2.1.3.2 Rigid steel conduit caps and recessed plugs shall be galvanized steel.

2.1.3.3 Conduit union fittings shall be steel, 1/2 inch - 1 inch or steel alloy 1-1/4 inch - 6 inch, with zinc-electroplated finish and in accordance with UL 514B. Appleton UNY and UNF or equal.

2.1.3.4 Weld fittings for stainless steel conduit shall be in accordance with ASTM A403/A403M.

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2.1.4 Conduit Support Devices and Hardware

2.1.4.1 Conduit supports unless otherwise noted on the Contract Drawings shall be fabricated of 12 gauge, 1-5/8 inch by 1-5/8 inch, metal framing channels: Unistrut P-1000, pre-dipped galvanized, with Unistrut P-1000 series, electrogalvanized, pipe clamps or equal.

2.1.4.2 Conduit clamps shall be malleable iron type with hot-dipped galvanized finish. Appleton Series PC or equal.

2.1.5 Identification

2.1.5.1 Identification of wall embeds shall be by means of a nameplate. Nameplates shall be 3" x 1" machine-engraved, phenolic with 1/2 inch high black figures on white background. The nameplates shall read in accordance with Specification Section 16111, Conduit Schedule, Attachment B, Embed Number.

2.1.5.2 Identification of conduits shall be by means of self-sticking vinyl cloth, black identification on an orange background, as manufactured by Brady Catalog #B-502 or equal. Label shall read in accordance with Specification Section 16111, Conduit Schedule, Attachment A, Raceway. No. Label length shall be as indicated below:

CONDUIT TRADE SIZE	BAND LENGTH	CHARACTER SIZE
3/4" and 1"	8"	1/2"
1-1/2" to 6"	8"	3/4"

2.1.6 Grounding Materials

2.1.6.1 Grounding Conductors

2.1.6.1.1 External building ground loop and bonded connections shall be 5/8 inch, 7 strand, low carbon grade steel conductor. Coating shall be Class B zinc in accordance with ASTM A475.

2.1.6.1.2 Internal building ground and bonded connections shall be bare copper wire in accordance with ASTM B3 and sized as indicated on the Contract Drawings. Wire shall be Class B concentric stranded in accordance with ASTM B8.

2.1.6.2 Ground Rods

Ground rods shall be galvanized steel, 5/8 inch diameter by 10 feet: Joslyn Number J5330 or equal.

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2.1.6.3 Embedded Ground Plates

2.1.6.3.1 Embedded ground plates shall be cast copper alloy body, four holes type and in accordance with UL 467. Cadweld Catalog Number B161-2Q or equal.

2.1.6.4 Ground Connections

2.1.6.4.1 Weld connections between ground conductors or between ground conductors to steel surfaces shall be by the exothermic process type. Cadweld or equal.

2.1.6.4.2 Ground connections to embedded ground plates shall be made with exothermic connection, Cadweld Type TA or equal as shown on the Contract Drawings.

2.1.6.4.3 Ground wells shall be in accordance with the Contract Drawings.

2.1.7 Conduit Anti-Seize Compounds

Anti-seize compounds for threads of rigid steel conduit shall be electrically conductive: Thomas and Betts Co. "Kopr-Shield" or equal.

2.1.8 Anti-Oxidizing Compound

Anti-oxidizing compound for connections of grounding connectors shall be electrically conductive, rust and corrosion inhibitive, Thomas and Betts "Kopr-Shield" or equal.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

Materials and devices specified herein shall be installed in accordance with Specification Section 16100, Electrical Installation.



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3.3      **FIELD QUALITY CONTROL**

Materials and devices specified herein shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

3.4      **ADJUSTMENTS**

(Not Used)

3.5      **CLEANING**

(Not Used)

3.6      **PROTECTION**

(Not Used)

3.7      **DEMONSTRATION**

(Not Used)

3.8      **SCHEDULES**

(Not Used)

**END OF SECTION**

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U.S. DEPARTMENT OF ENERGY  
Hanford Waste Vitrification Plant  
Richland, Washington  
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457

SECTION 16111  
CONDUIT SCHEDULE  
(B-595-C-B210A-16111)

ISSUED FOR BID PURPOSES ONLY

REVISION NO. D  
ISSUE DATE 11-12-92

WAPA YES     NO X  
QUALITY LEVEL I     II X  
SAFETY CLASS 1     2     3     4 X

ORIGINATOR:

CHECKER:

Charles Simpson 11-11-92  
C. C. Simpson, Electrical Engineer Date

K. K. Srivastava 11/12/92  
K. K. Srivastava, Electrical Engr. Date

APPROVED BY:

K. A. Owrey  
K. A. Owrey Lead Discipline Engineer

11-12-92  
Date

NOV 16 1992

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SECTION 16111  
CONDUIT SCHEDULE

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>	<u>REV. NO</u>
A	ELECTRICAL CONDUIT SCHEDULE	D
B	ELECTRICAL EMBEDS SCHEDULE	D

8220-202146  
9413202-028

**SECTION 16111  
CONDUIT SCHEDULE**

**PART 1 GENERAL**

**1.1 SUMMARY**

This section includes the conduit and embed schedule for the Vitrification Building foundation.

**1.2 REFERENCES**

(Not Used)

**1.3 RELATED REQUIREMENTS**

Specification Section 16100 Electrical Installation

Specification Section 16110 Electrical Materials and Devices

**1.4 DEFINITIONS**

(Not Used)

**1.5 SYSTEM DESCRIPTION**

(Not Used)

**1.6 SUBMITTALS**

(Not Used)

**1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

**1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

**1.8.1 Climatic and Geographic Site Conditions**

- |    |                               |                          |
|----|-------------------------------|--------------------------|
| A. | Site Elevation                | 714 feet above sea level |
| B. | Barometric Pressure           | 14.3 psia                |
| C. | Outside Design Temperature    |                          |
|    | 1) Maximum Design Temperature | 110°F                    |
|    | 2) Minimum Design Temperature | -20°F                    |

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**PART 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

2.1.1 All materials shall be supplied in accordance with Specification Section 16110.

**2.2 FABRICATION AND MANUFACTURE**

(Not Used)

**PART 3 EXECUTION**

**3.1 PREPARATION**

(Not Used)

**3.2 INSTALLATION, APPLICATION AND ERECTION**

3.2.1 Conduits and embeds shall be in accordance with Attachment A and Attachment B of this specification section and Specification Section 16100, Electrical Installation.

**3.3 FIELD QUALITY CONTROL**

(Not Used)

**3.4 ADJUSTMENTS**

(Not Used)

**3.5 CLEANING**

(Not Used)

**3.6 PROTECTION**

(Not Used)

**3.7 DEMONSTRATION**

(Not Used)

**3.8 SCHEDULES**

(Not Used)

**END OF SECTION**

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Electrical Conduit Schedule for Package Number B210A

BLDG NO.	RACEWAY NO.	FOR	FROM		TO		RACEWAY SIZE			INCLUDED CABLE NOS.
			EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	CONDUIT		TRAY CODE	
							AG	UG		
01	A0001	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0002	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0003	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0004	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0005	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0006	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0007	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0008	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0009	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0010	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0011	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0012	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	A0013	ALARM	STUB-UP @GRID A-1	H-2-122383-1	STUB-OUT @GRID A-1	H-2-122383-1		2"		

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Fluor Contract 8457  
11/11/92

**Electrical Conduit Schedule for Package Number B210A**

BLDG NO.	RACEWAY NO.	FOR	FROM		TO		RACEWAY SIZE			INCLUDED CABLE NOS.
			EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	CONDUIT		TRAY CODE	
							AG	UG		
01	A0014	ALARM	STUB-UP @GRID A-19	H-2-122383-2	STUB-OUT @GRID A-19	H-2-122383-2		2"		
01	A0015	ALARM	STUB-UP @GRID F-19	H-2-122383-4	STUB-OUT @GRID F-19	H-2-122383-4		2"		
01	C0001	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	C0002	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	C0003	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	C0004	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	C0005	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	C0006	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		2"		
01	G0001	ISOLATED GND	STUB-UP @GRID A-1	H-2-122383-1	STUB-OUT @GRID A-1	H-2-122383-1		2"		
01	G0002	ISOLATED GND	STUB-UP @GRID A-19	H-2-122383-2	STUB-OUT @GRID A-19	H-2-122383-2		2"		
01	G0003	ISOLATED GND	STUB-UP @GRID F-19	H-2-122383-4	STUB-OUT @GRID F-19	H-2-122383-4		2"		
01	P0001	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0002	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		

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Advanced Technology Division  
Fluor Contract 8457  
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### Electrical Conduit Schedule for Package Number B210A

BLDG NO.	RACEWAY NO.	FOR	FROM		TO		RACEWAY SIZE			INCLUDED CABLE NOS.
			EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	CONDUIT		TRAY CODE	
							AG	UG		
01	P0003	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0004	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0005	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0006	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0007	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0008	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0009	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0010	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0011	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0012	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0013	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0014	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		
01	P0015	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3		4"		



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FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457  
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Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1000	CCTV-710-032	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1001	CCTV-710-033	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1002	CCTV PLUG-IN-STATION	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1003	COMM	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1004	WELDER TROLLEY POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1005	WELDER TROLLEY POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1006	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1007	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1008	FUTURE WELDER POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1009	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1010	FUTURE WELDER CONTROL	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1011	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1012	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1013	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1014	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1015	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1016	WELDER INSTR	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	

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Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1017	WELDER INSTR	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1018	ICC PRES RAM INSTR	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1019	WELDER TROLLEY INSTR	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1020	WELDER TROLLEY INSTR	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1021	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1022	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1023	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1024	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1025	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1026	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1027	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1028	SPARE	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1029	DETECTORS	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1030	CCTV-230-001	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1031	STS TURNABLE POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1032	STS TURNABLE POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1033	CCTV-710-012	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	

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Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1034	CCTV LIFT PLATE HD-230-001	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1035	INSTR (TE)	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1036	STS TURNABLE POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1037	STS TRANSFER SYSTEM	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1038	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1039	LIGHTING	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1040	CRANE POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1041	CRANE POWER	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1042	CRANE CONTROL	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1043	CRANE CONTROL	SMEAR TEST/EXIT TUNNEL 0086	EXIT TUNNEL OPER GALLERY 0082	0086W1	H-2-122385-1	2"	
01	E1044	POWER	CORRIDOR 0012	AIRLOCK 0096	0096W1	H-2-122385-1	2"	
01	E1045	LIGHTING	CORRIDOR 0012	AIRLOCK 0096	0096W1	H-2-122385-1	2"	
01	E1046	INSTRUMENTATION	CORRIDOR 0012	AIRLOCK 0096	0096W1	H-2-122385-1	2"	
01	E1047	SPARE	CORRIDOR 0012	AIRLOCK 0096	0096W1	H-2-122385-1	2"	
01	E1048	POWER	CORRIDOR 0012	AIRLOCK 0097	0097W1	H-2-122385-1	2"	
01	E1049	LIGHTING	CORRIDOR 0012	AIRLOCK 0097	0097W1	H-2-122385-1	2"	
01	E1050	INSTRUMENTATION	CORRIDOR 0012	AIRLOCK 0097	0097W1	H-2-122385-1	2"	

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 Advanced Technology Division  
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 11/11/92

Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1051	SPARE	CORRIDOR 0012	AIRLOCK 0097	0097W1	H-2-122385-1	2"	
01	E1052	CCTV POWER	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1053	LIGHTING	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1054	INSTRUMENTATION	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1055	SPARE	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1056	SPARE	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1057	SPARE	STAIR NO. 10 0042	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1058	CCTV-710-016	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1059	LIGHTING	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1060	INSTRUMENTATION	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1061	COMM	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1062	SPARE	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1063	SPARE	EMPTY CANSTR ENTRY TNL 0040	REMOTE CELL OPER GALLERY 1300	0040W1	H-2-122385-1	2"	
01	E1064	POWER	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1065	POWER	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1066	LIGHTING	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1067	LIGHTING	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	

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FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457  
11/11/92

Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1068	INSTRUMENTATION	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1069	INSTRUMENTATION	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1070	COMM	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1071	SPARE	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1072	SPARE	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1073	SPARE	SERVICE CORRIDOR 1020	RAILROAD WELL 0067	0048W3	H-2-122385-2	2"	
01	E1074	LIGHTING	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1075	LIGHTING	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1076	LIGHTING	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1077	LIGHTING	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1078	CCTV TEST STAND	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1079	ELEC POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1080	CELL POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1081	ELEC POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1082	CELL POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1083	IN-CELL PENDANT	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1084	ELEC POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	

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Waste Vitrification Plant  
Richland, Washington  
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FLUOR DANIEL, INC.  
Advanced Technology Division  
Fluor Contract 8457  
11/11/92

Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1085	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1086	CCTV TEST STAND	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1087	CMM STAND	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1088	CMM STAND	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1089	CRANE STAND	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1090	EMM CONTROL STATION	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1091	CTG TOOLS POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1092	HAND SW FOR WELDERS	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1093	HAND SW FOR WELDERS	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1094	ELEC POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1095	CELL POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1096	CELL POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1097	IN-CELL SUIT PHONE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1098	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1099	WELDER POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1100	WELDER POWER	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0066 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1101	EXH TUNNEL SUMP PUMP POWER	EXIT TUNNEL OPER GALLERY 0082	EXHAUST TUNNEL 0046	0082W1 0003W2	H-2-122385-1	2"	

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U.S. DEPARTMENT OF ENERGY  
Waste Vitrification Plant  
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Advanced Technology Division  
Fluor Contract 8457  
11/11/92

Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1102	SPARE	EXIT TUNNEL OPER GALLERY 0082	EXHAUST TUNNEL 0046	0082W1 0003W2	H-2-122385-1	2"	
01	E1103	PWR CONN FROM DETECTOR TO DISPLAY	CORRIDOR 0012	SMEAR TEST/EXIT TUNNEL 0086	0086W2	H-2-122385-1	2"	
01	E1104	PWR CONN FROM DETECTOR TO DISPLAY	STAIR NO. 10 0042	EMPTY CANSTR ENTRY TUNNEL 0040	0040W1	H-2-122385-1	2"	
01	E1105	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1154	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1155	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1156	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1157	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1158	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1159	SPARE	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1160	COMMUNICATION	SMEAR TEST/EXIT TUNNEL RM 0086	EXIT TUNNEL OPER GALLERY RM 0082	0086W1	H-2-122385-1	2"	
01	E1161	COMMUNICATION	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1162	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1163	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1164	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1165	COMMUNICATION	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1166	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	



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U.S. DEPARTMENT OF ENERGY  
 Waste Vitrification Plant  
 Richland, Washington  
 DOE Contract DE-AC06-86RL10838  
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FLUOR DANIEL, INC.  
 Advanced Technology Division  
 Fluor Contract 8457  
 11/11/92

Electrical Embed Schedule for Package Number B210A

BLDG NO.	EMBED NO.	FOR	FROM	TO	WALL NO.	PLAN DRAWING	EMBED SIZE	INCLUDED CABLE NOS.
			LOCATION AND ROOM NUMBER	LOCATION AND ROOM NUMBER				
01	E1167	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	
01	E1168	SPARE	CONTACT DECON & MAINT CELL 0066	STUB-UP BETWEEN RM 0086 0056 & 0121	0047W1	H-2-122385-2	2"	

SECTION 16905  
ELECTRICAL TESTING  
(B-595-C-B210A-16905)

ISSUED FOR BID PURPOSES ONLY

REVISION NO. D  
ISSUE DATE 11-12-92

WAPA YES     NO X  
QUALITY LEVEL I     II X  
SAFETY CLASS 1     2     3     4 X

ORIGINATOR:

Charles Simpson 11-11-92  
C. C. Simpson, Electrical Engineer Date

CHECKER:

K. K. Srivastava 11/12/92  
K. K. Srivastava, Electrical Engr. Date

APPROVED BY:

K. A. Owrey  
K. A. Owrey Lead Discipline Engineer

11-12-92  
Date

Rev. D

SECTION 16905  
ELECTRICAL TESTING

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(B-595-C-B210A-16905)

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**SECTION 16905  
ELECTRICAL TESTING**

**PART 1 GENERAL**

**1.1 SUMMARY**

- 1.1.1 This specification section defines the electrical tests, checks, inspections and the Construction Acceptance Tests, CATs requirements for the acceptance of electrical components and/or systems furnished by the Seller.
- 1.1.2 The purpose of the specified tests and inspections is to determine that each component is in compliance with the Contract Drawings and specifications.
- 1.1.3 It is the intent of these requirements to ensure that all workmanship, materials and the manner and method of erection and installation conform to manufacturer's instructions, Contract Drawings and specifications.
- 1.1.4 The Seller shall perform and supervise all tests, checks, inspections and the CATs unless specifically noted otherwise herein or on the Contract Drawings. The Seller shall furnish all test equipment required for the tests performed by him and shall be responsible for providing such safety measures as are required for each test.
- 1.1.5 Seller shall repair or replace and retest any components or installation which are damaged or have failed the initial tests.
- 1.1.6 If permanent power is not available at the time of testing, temporary construction power shall be used to perform these tests.

**1.2 REFERENCES**

The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only.

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

NFPA 70                      1990 National Electrical Code (NEC)

**INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)**

IEEE 81                      1983 Guide for Measuring Earth  
Resistivity, Ground Impedance, and Earth  
Surface Potentials of a Ground System

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1.3 **RELATED REQUIREMENTS**

Specification Section 16100 Electrical Installation

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Procedures, for Buyer's approval, of all tests, checks and inspection including procedures for Construction Acceptance Tests.

1.6.2 Certified Test reports shall be per the requirements of Field Quality Control Section.

1.6.3 The test reports shall contain as a minimum the following information:

- 1) Job title
- 2) Date of test
- 3) Equipment, system, or cable identification
- 4) Specific type of test
- 5) Description of test instrument and date of calibration
- 6) Section of specification defining test
- 7) Test results
- 8) Signature of person supervising test
- 9) Signature of Seller
- 10) Space for Buyer's signature

1.6.4 The Seller shall submit to the Buyer for approval, a complete listing of proposed calibrating and testing equipment, including calibration standards with current certification from the National Institute of Standards and Technology.

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1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
  - 1) Maximum Design Temperature 110°F
  - 2) Minimum Design Temperature -20°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Furnish all materials and test equipment required to perform tests, checks, inspections and the CATs in accordance with this specification section.
- 2.1.2 The calibrating and testing equipment used for tests, checks, inspections and CATs shall be calibrated within six months prior to testing. Seller shall provide proof of calibration.
- 2.1.3 Furnish test equipment calibration traceable to standards of the U.S. Bureau of Standards for all test equipment used in calibration. The calibration results shall be logged and available to the Buyer for inspection.
- 2.1.4 Equipment failing the standards test must not be used until repaired and re-standardized. All calibrating and testing equipment shall have valid calibration label affixed to the equipment during usage. The label shall be affixed in a prominent location. The Buyer can, at his discretion, require the calibrating and testing equipment to be checked to the standards. Standards must not be used as calibration and testing devices in the field.
- 2.1.5 The Seller shall be required, every six months, to verify the standards for the project to calibration standards which have current certification from the National Institute of Standards and Technology.

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2.1.6 Seller shall be responsible for ensuring that the accuracy of the calibration equipment is equal to or better than the accuracy of the equipment to be calibrated/tested.

2.1.7 Seller shall maintain a calibration log showing date, location, name of lab if applicable, certification number and name of certifier. Log must be kept current and available to the Buyer for inspection.

## 2.2 FABRICATION AND MANUFACTURE

(Not Used)

## PART 3 EXECUTION

### 3.1 PREPARATION

3.1.1 Seller shall submit all test procedures to Buyer for approval prior to testing.

3.1.2 All test voltages listed in this specification shall be verified against manufacturer's instructions and adjusted as applicable.

### 3.2 INSTALLATION, APPLICATION AND ERECTION

Refer to Specification Section 16100, Electrical Installation.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 General

3.3.1.1 Construction Acceptance Tests, verifications and inspections shall be performed on the Vitrification Building foundation package, to demonstrate that the completed electrical installation and/or construction package meets the requirements of the Contract Drawings, specifications, and the National Electrical Code. The following specific paragraphs of this specification are contained as a minimum, in the procedures for Construction Acceptance Tests.

A. Paragraph 3.3.2.1

B. Paragraph 3.3.2.2

#### 3.3.1.2 Inspection

The Seller shall visually inspect the installation to verify conformance to this specification and the Contract drawings. This inspection shall take into consideration, for example: proper material and conductor identification, verification of completeness, accurate placement, proper attachment of all ground connection.

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3.3.2        Grounding

3.3.2.1     Test No. 1 - Individual Ground Rods

Before connection to the ground mat, each ground rod shall be tested for resistance to earth by a Biddle null balance "Earth Tester" using the "Three-Point Method" described in IEEE Standard No. 81 using two auxiliary rods.

3.3.2.1.1   Test report shall be submitted to the Buyer.

3.3.2.2     Test No. 2 - Complete Ground Mat

3.3.2.2.1   After completion of Test No. 1, all ground rods shall be connected to the ground mat. Before any backfilling the complete ground mat shall be inspected to ensure that all connections have been made solid and/or mechanically tight.

3.3.2.2.2   After inspection, backfilling shall be done and the resistance of the complete ground mat to earth shall then be tested. The mat resistance shall be determined by use of the "Fall-of-Potential Method," as described in the IEEE Standard No. 81.

3.3.2.2.3   Test report showing the ground mat resistance value shall be submitted to the Buyer.

3.4        **ADJUSTMENTS**

(Not Used)

3.5        **CLEANING**

Clean and remove all debris and equipment from the job site after completion of testing.

3.6        **PROTECTION**

(Not Used)

3.7        **DEMONSTRATION**

(Not Used)

3.8        **SCHEDULES**

(Not Used)

**END OF SECTION**



RELATED DOCUMENT NO. 1  
PIPING ISOMETRICS  
(B-595-C-B210A-RD-1)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0  
ISSUE DATE 11-10-92

WAPA YES    NO X  
QUALITY LEVEL I    II X  
SAFETY CLASS 1    2    3 X 4   

ORIGINATOR(S):

CHECKER(S):

G. Van Viegen 11-10-92 G. Barauskas 11-10-92  
G. Van Viegen, Piping (Date) G. Barauskas, Piping Supervisor (Date)

APPROVED BY:

K. C. Baughman 11/10/92  
K. C. Baughman Lead Discipline Engineer (Date)

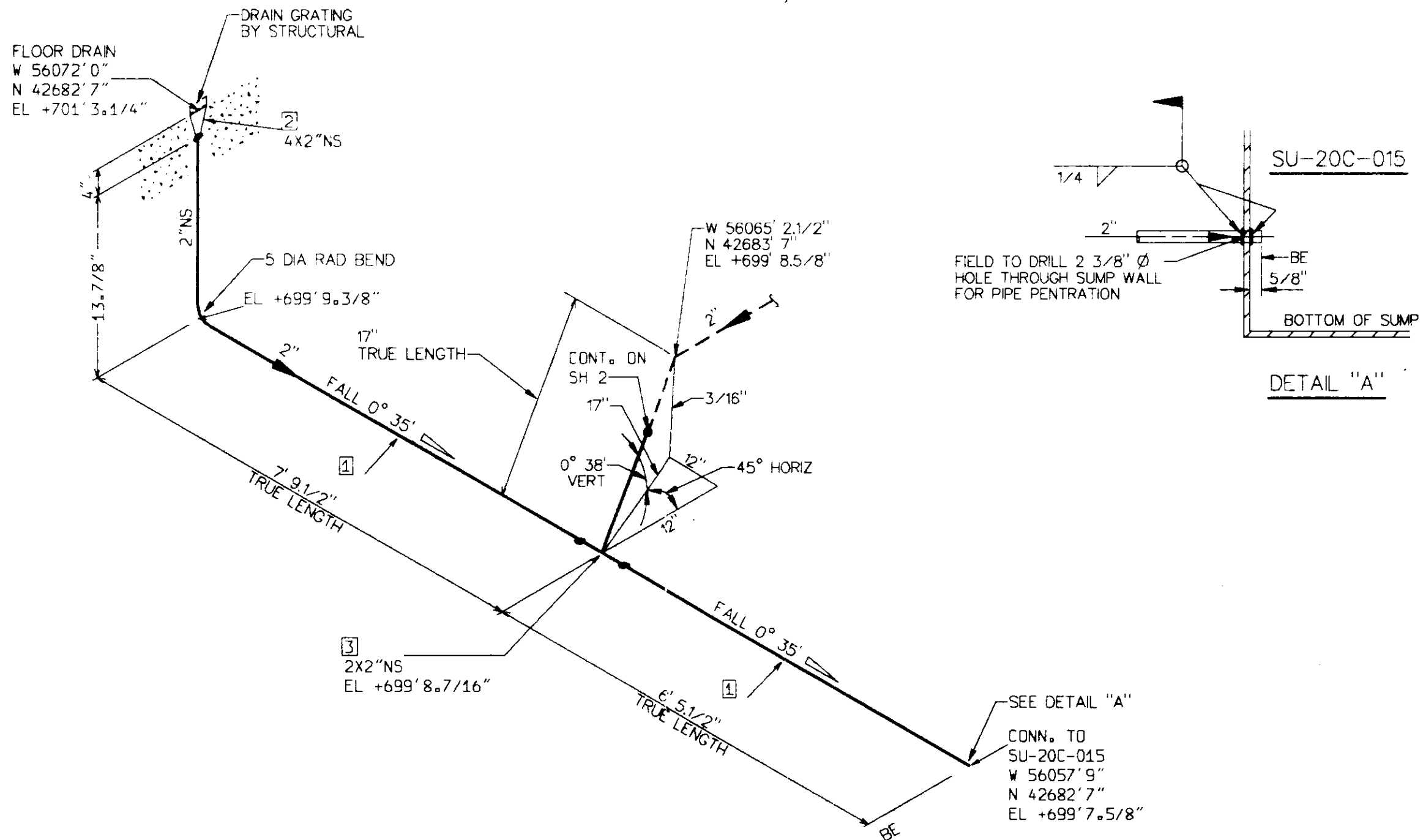
NOV 16 1992

PAGE 1 OF 1  
 STATUS DATE 11/11/92  
 CONTRACT 845734

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DWG REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS
H-2-126175	1	0	11/17/92	PE-2"-20C-159-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126175	2	0	11/17/92	PE-2"-20C-159-A-NONE SHEET 02 PIPING ISOMETRIC	
H-2-126176	1	0	11/17/92	PE-1"-20C-147-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126177	1	0	11/17/92	PE-1"-20C-148-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126178	1	0	11/17/92	PE-1"-20C-152-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126179	1	0	11/17/92	PE-1"-20C-153-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126180	1	0	11/17/92	PE-1"-20C-151-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126181	1	0	11/17/92	PE-1"-20C-141-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126182	1	0	11/17/92	PE-1"-20C-142-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126183	1	0	11/17/92	PE-1"-20C-143-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126184	1	0	11/17/92	PE-1"-20C-144-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126185	1	0	11/17/92	PE-1"-20C-149-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126186	1	0	11/17/92	PE-1"-20C-146-A-NONE SHEET 01 PIPING ISOMETRIC	
H-2-126187	2	0	11/17/92	PE-6"-520-067-DD-NONE SHEET 02 PIPING ISOMETRIC	
H-2-126187	3	0	11/17/92	PE-6"-520-067-DD-NONE SHEET 03 PIPING ISOMETRIC	

TOTAL: 15




NOV 13 1992

QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES4T

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APPV'D	MAT'L	STRESS	INSULATION					FABRICATION SPECIFICATION					 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-B6RL10838								
								IH	IS	IC	IA	NONE																
								TOTAL ISO					X	B-595-C-B210A SECTION 15060														
								PARTIAL ISO																				
								HEAT TRACING REQUIREMENTS				YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE	CADFILE	CADCODE	PROJECT TITLE								
								TRACING MEDIUM					X	DESIGN	25	150	REG FLR DRAIN	B126175A	28: APL:DDM3:7.0:SS	HANFORD WASTE VITRIFICATION PLANT								
								TRACER: QTY					X	OPERATING	0	AMBIENT	VAPOR		Liquid	X	DRAWN BY: E COLLINS	DATE 08/04/92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. B210A			
								ELECTRIC TRACE					X	REFERENCE PLAN DWG H-2-124095-1			REFERENCE P&ID H-2-123060-9			CLASSIFICATION NONE			BY NOT REQUIRED			SCALE NONE	BUILDING NO. 1	INDEX NO.
								HEAT TRANSFER CEMENT REQUIRED					X	SECTION B7-8			LINE NUMBER AND CLASS PE-2"-20C-159-A-NONE			SHEET 01	OF	DRAWING NUMBER H-2-126175			SHEET 1	OF	REV. 0	

210A H-2-126175 10 AFC 77 78 79 80

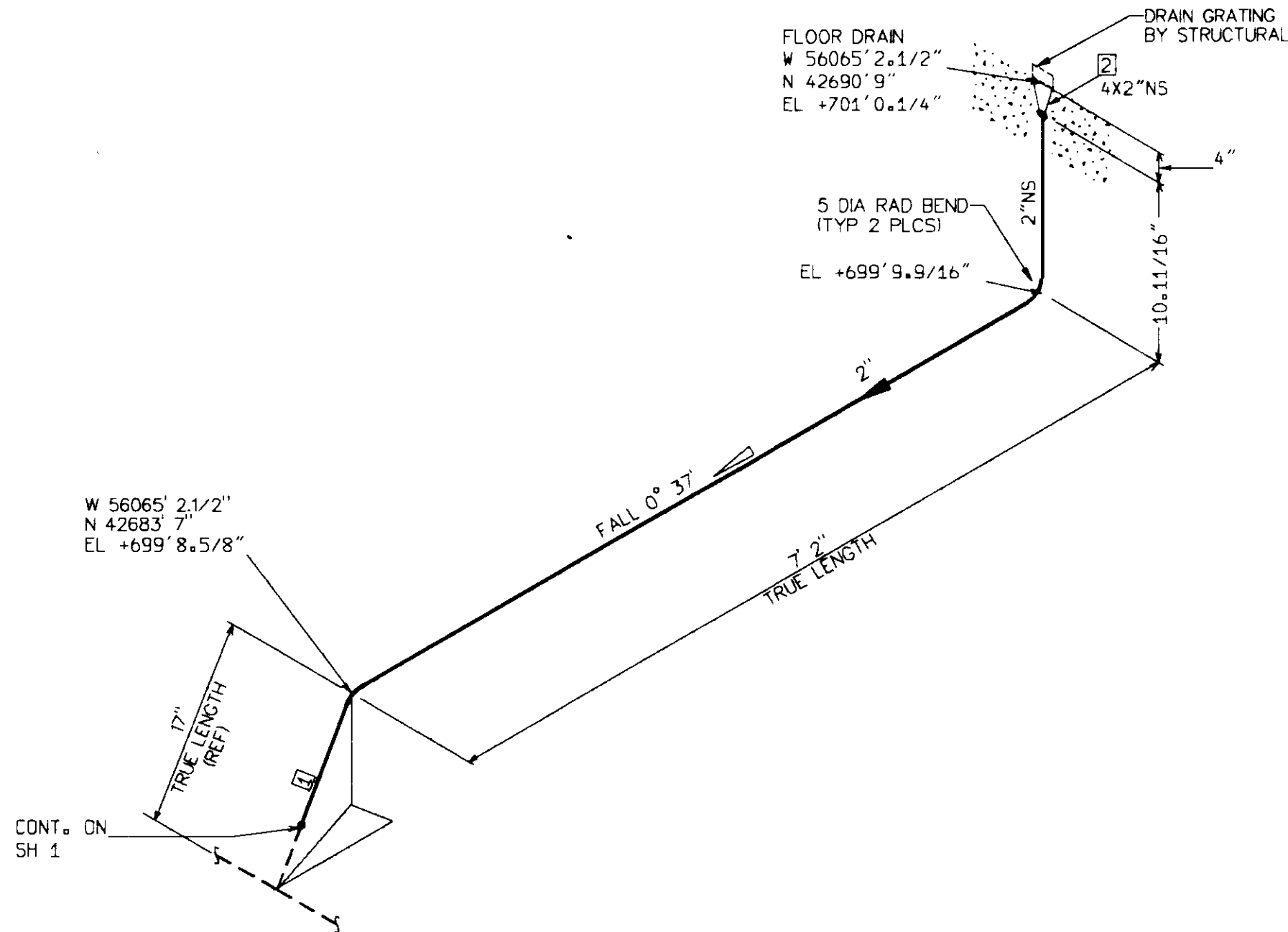
DISTRIBUTION CODE: 504 PDS MKF 10/22/92

Oct 22 09:38:21 1997 C:\MAV\ITEM F:\XVR3MF73.SPI

I FABRICATION MATERIALS I

PT NO	COMPONENT DESCRIPTION	N.S. (INS)	ITEM CODE	QTY
---	PIPE	---	---	---
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	2	5364086	14.7'
	FITTINGS			
2	REDCBW REDUCER CONC SCH 40S 304L SS A403 WP304L	4X2	5438933	1
3	LATBW LATERAL, SCH40S, SMLS, SS-304L	2X2	5440851	1


BILL OF MATERIAL FOR REFERENCE ONLY



NOV 13 1992  
QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES4T

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL10838				
								TOTAL ISO					X	B-595-C-B210A SECTION 15060				CADFILE B126175B		CADCODE 2B: APL: DDM3: 7.0: SS		PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT		
								PARTIAL ISO										DRAWN BY: E COLLINS		DATE 08/03/92		PROJECT B-595		
								HEAT TRACING REQUIREMENTS	YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE			CLASSIFICATION NONE		BY NOT REQUIRED		FLUOR CONTRACT NO. 8457			
								TRACING MEDIUM		X	DESIGN	25	150	REG FLR DRAIN			LINE NUMBER AND CLASS PE-2"-20C-159-A-NONE		SHEET 02 OF 02		CWBS NO. B210A			
								TRACER: QTY SIZE		X	OPERATING	0	AMBIENT	VAPOR	LIQUID	X					BUILDING NO. 1			
								ELECTRIC TRACE		X	REFERENCE PLAN DWG H-2-124095-1				REFERENCE P&ID H-2-123060-9						SCALE NONE			
								HEAT TRANSFER CEMENT REQUIRED		X	SECTION B8										INDEX NO.			
0	AFC	ELC																						

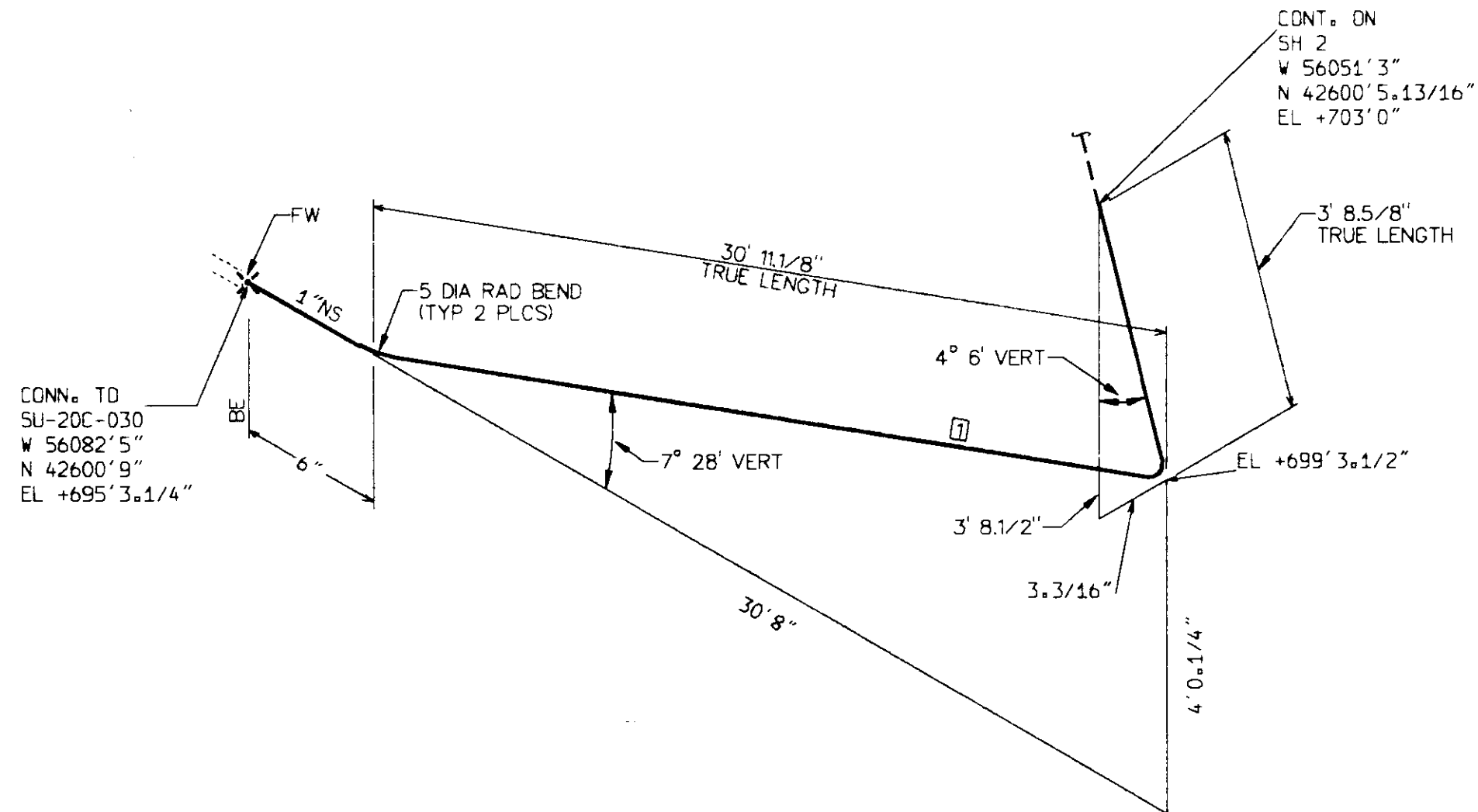
210A H-2-126175 0 2 AFC

DISTRIBUTION CODE: 504 PDS MKF 10/22/92

Oct 22 09:34:13 1992 CALMA VELLUM E:XXB3MF75.SPL

-----   FABRICATION MATERIALS   -----				
PT NO --	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
PIPE				
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	2	5364086	9.0'
FITTINGS				
2	REDCBW REDUCER CONC SCH 40S 304L SS A403 4X2 WP304L		5438933	1

BILL OF MATERIAL FOR REFERENCE ONLY




NOV 13 1992

QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES4T

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APPV'D	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL10838		
								TOTAL ISO					X	B-595-C-B210A SECTION 15060				CADFILE		PROJECT TITLE		
								PARTIAL ISO										B126177A		HANFORD WASTE VITRIFICATION PLANT		
								HEAT TRACING REQUIREMENTS					YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE	CADCODE	SCALE		
															DESIGN	0.500	150	PROCESS	2B: APL:DDM3:7.0:SS	NONE		
								TRACING MEDIUM						X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	BUILDING NO.	
								TRACER: QTY						X	REFERENCE PLAN DWG		REFERENCE P&ID		DATE		INDEX NO.	
								ELECTRIC TRACE						X	H-2-124094-1		H-2-123060-15/8		08/03/92			
								HEAT TRANSFER CEMENT REQUIRED						X	SECTION		C3/A7		BY NOT REQUIRED			
0	AFC	ELC	11/13/92	580											LINE NUMBER AND CLASS		PE-1"-20C-148-A-NONE		SHEET	OF	DRAWING NUMBER	
																			01		H-2-126177	

210A H-2-126177 10 1 77 76 75 80

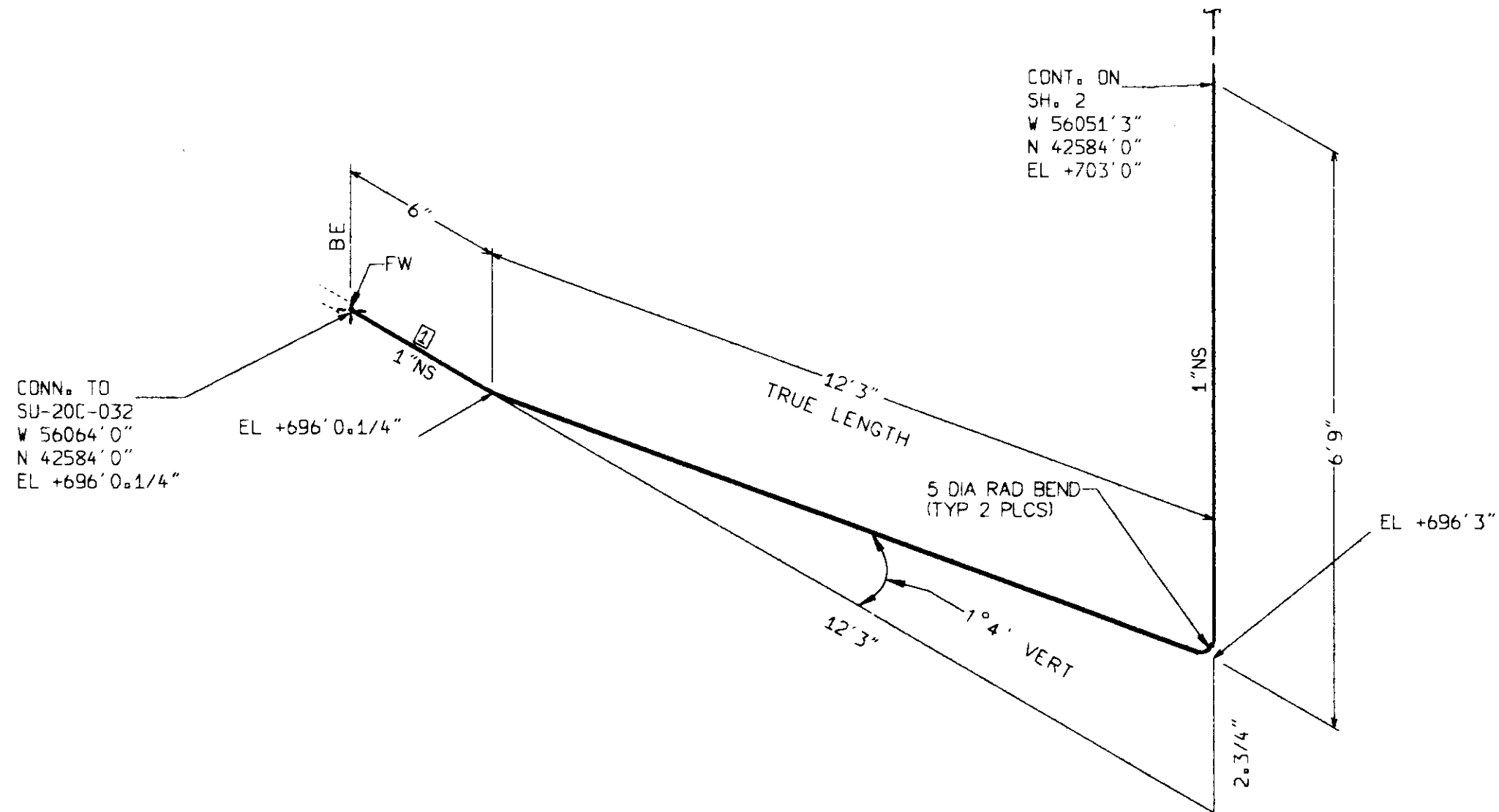
DISTRIBUTION CODE: 504 PDS MKF 10/22/92

Oct 22 09:48:18 1992 CALMA VELLUM E:XXB3MF77.SPL

I FABRICATION MATERIALS I				
PT NO --	PIPE	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE QTY -----
1	PIPBAR PIPE	SCH 40S SMLS 304L SS A312	1	5364086 35.2'


BILL OF MATERIAL FOR REFERENCE ONLY





QUALITY LEVEL II  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION	U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL1083B							
								TOTAL ISO					X	B-595-B210A SECTION 15060					CADFILE	CADCODE	PROJECT TITLE					
								PARTIAL ISO						HEAT TRACING REQUIREMENTS		YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE	B126176A	2B: APL:DDM3:7.0:SS	HANFORD WASTE VITRIFICATION PLANT		
								TRACING MEDIUM					X	DESIGN	0.500	150	PROCESS		DRAWN BY: E. COLLINS		DATE 08/17/92	PROJECT B-595	FLUOR CONTRACT NO. B457	CWBS NO. B210A		
								TRACER: QTY				SIZE	X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	CLASSIFICATION NONE		By NOT REQUIRED		SCALE NONE	BUILDING NO. 1	INDEX NO.
								ELECTRIC TRACE					X	REFERENCE PLAN DWG H-2-124094-1		REFERENCE P&ID H-2-123060-15/8		LINE NUMBER AND CLASS PE-1"-20C-147-A-NONE		SHEET 01	OF	DRAWING NUMBER H-2-126176		SHEET 1	OF	REV. 0
0	AFC	ELC	11-15-92	SPC				HEAT TRANSFER CEMENT REQUIRED					X			SECTION B3/A7										

[illegible]

DISTRIBUTION CODE: 504

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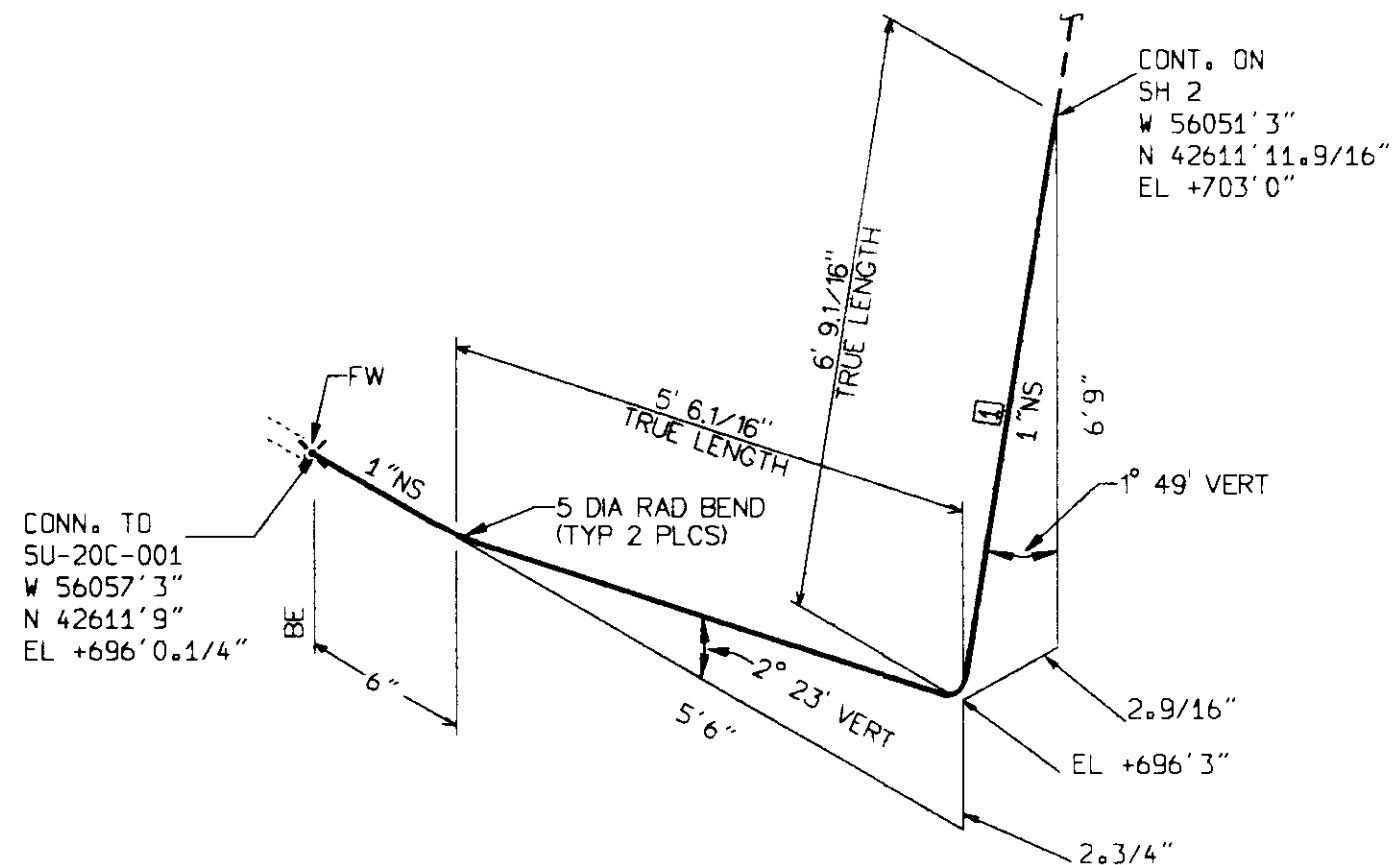
MMF  
10/22/92

Oct 22 09:43:08 1992 CALMA VERLUM E:XXB3MF76.SPL

-----  
I FABRICATION MATERIALS I  
-----

PT NO --	PIPE -----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
1		PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086	19.5'

BILL OF MATERIAL FOR REFERENCE ONLY



NOV 13 1992

QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES4T

[X] DENOTES PART NO.,  
SEE BILL OF MATERIAL

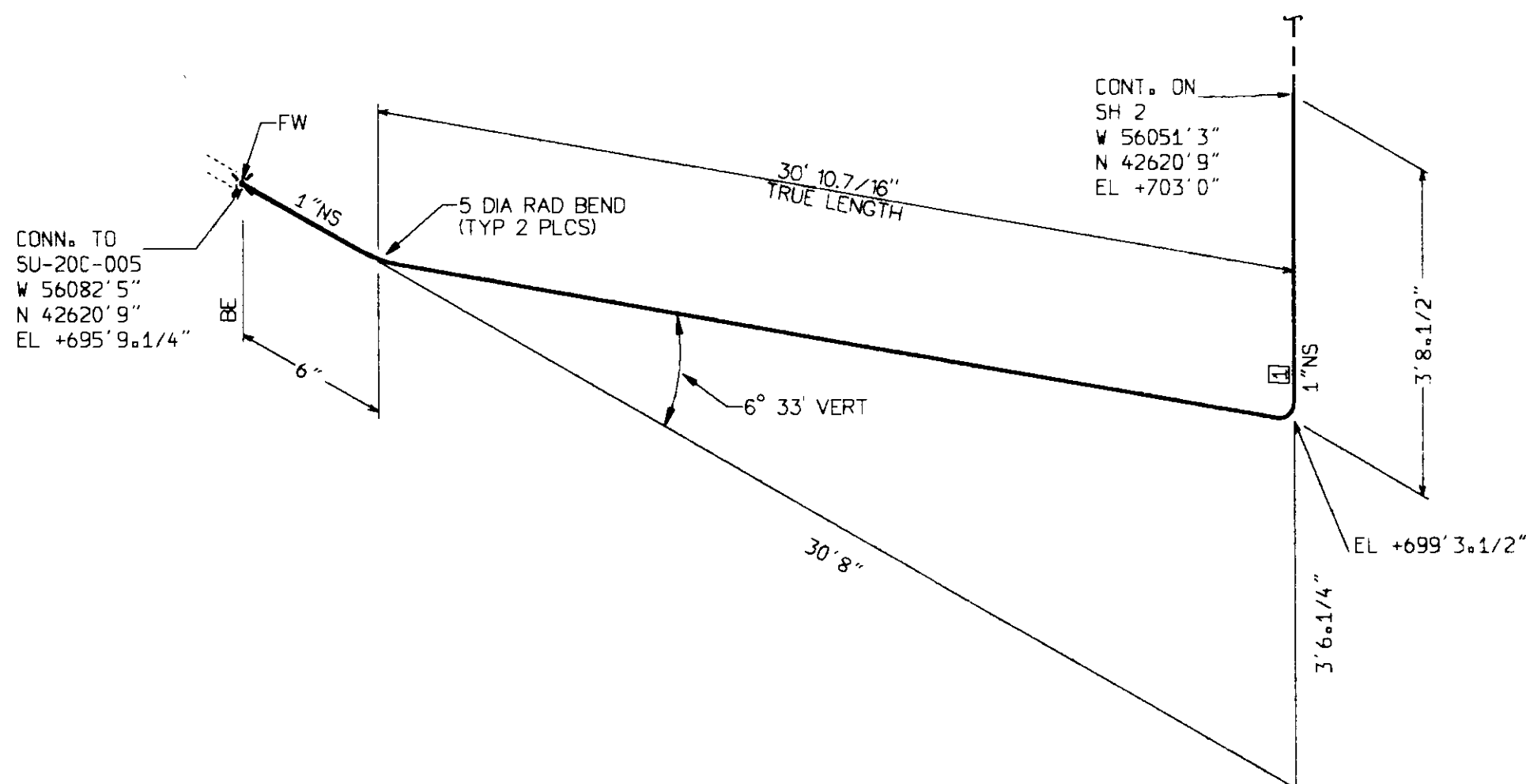
REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION	FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL10838		
								TOTAL ISO					X	B-595-C-B210A SECTION 15060	CADFILE B126178A		PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT		
								PARTIAL ISO						CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE	CADCODE 2B:APL:DDM3:7.0:SS	
								HEAT TRACING REQUIREMENTS					YES	NO	DESIGN	0.500	150	PROCESS	DATE 08/03/92
								TRACING MEDIUM					X	OPERATING	0	AMBIENT	VAPOR	X	Liquid
								TRACER: QTY					X	REFERENCE PLAN DWG H-2-124094-1	REFERENCE P&ID H-2-123060-15/8		CLASSIFICATION NONE BY NOT REQUIRED		
								ELECTRIC TRACE					X	SECTION F3/A7	LINE NUMBER AND CLASS PE-1"-20C-152-A-NONE		SHEET 01	OF	PROJECT B-595
								HEAT TRANSFER CEMENT REQUIRED					X						FLUOR CONTRACT NO. 8457
																			CWBS NO. B210A
																			INDEX NO.
																			DRAWING NUMBER H-2-126178
																			SHEET 1
																			REV. 0

Oct 22 09:54:27 1992 CALMA VELLUM E:XXB3MF78.SPL

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FABRICATION MATERIALS

PT NO	COMPONENT DESCRIPTION	N.S. (INS)	ITEM CODE	QTY
---	PIPE	---	---	---
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086	12.8'

BILL OF MATERIAL FOR REFERENCE ONLY




NOV 13 1992

QUALITY LEVEL II

SAFETY CLASS 3

MODEL: PIPE/PAES4T

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHKD	APPVD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL10838		
								TOTAL ISO					X	B-595-C-B210A SECTION 15060				CADFILE B126179A		PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT		
								PARTIAL ISO										CADCODE 2B: APL:DDM3:7.0:SS		PROJECT B-595		
								HEAT TRACING REQUIREMENTS					YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE		FLUOR CONTRACT NO. B457		
								TRACING MEDIUM						X	DESIGN	0.500	150	PROCESS		CWBS NO. B210A		
								TRACER: QTY						X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	DRAWN BY: E COLLINS	
								TRACER: SIZE						X	REFERENCE PLAN DWG H-2-124094-1		REFERENCE P&ID H-2-123060-15/8		DATE 08/03/92		INDEX NO.	
								ELECTRIC TRACE						X	CLASSIFICATION NONE		BY NOT REQUIRED		SCALE NONE		BUILDING NO. 1	
								HEAT TRANSFER CEMENT REQUIRED						X	SECTION E3/A7		LINE NUMBER AND CLASS PE-1"-20C-153-A-NONE		SHEET 01		REV. 0	

210A H-2-126179 0 1

DISTRIBUTION CODE: 504

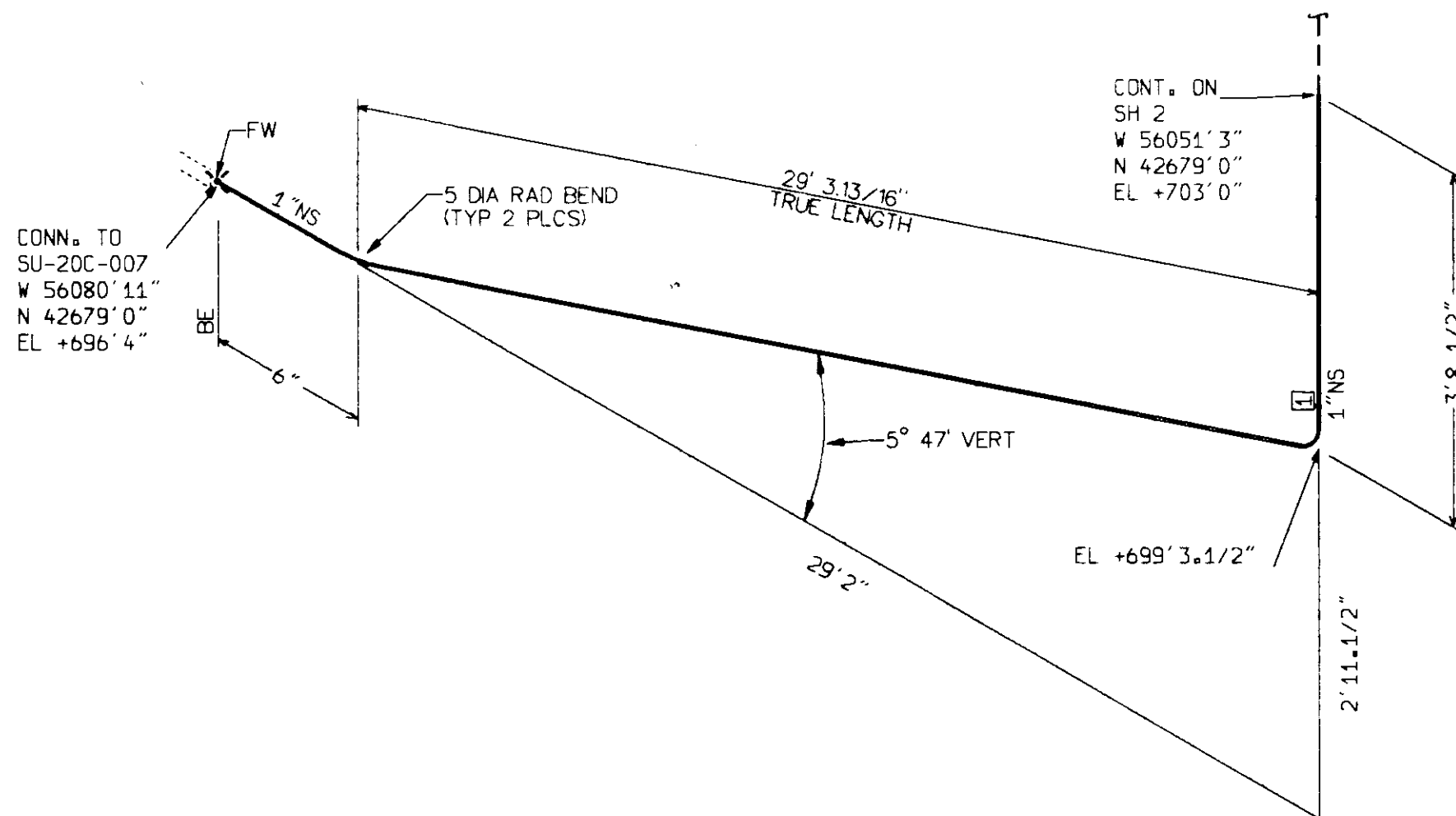
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MKF  
10/27/92

U Oct 22 09:59:13 1997 CALIMA VILLUM F:XXB3MF79 SPL

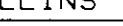
I FABRICATION MATERIALS I				
PT NO --	PIPE -----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE    QTY -----
1	PIPBAR PIPE	SCH 40S SMLS 304L SS A312	1	5364086    35.1'

BILL OF MATERIAL FOR REFERENCE ONLY



QUALITY LEVEL I  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'D	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b>	<b>U.S. DEPARTMENT OF ENERGY</b> Richland Field Office DE-AC06-86RL10838											
								TOTAL ISO					X	B-595-C-B210A SECTION 15060					CADFILE B126180A	CADCODE 2B: APL:DDM3:7.0:SS	PROJECT TITLE <b>HANFORD WASTE VITRIFICATION PLANT</b>									
								PARTIAL ISO										HEAT TRACING REQUIREMENTS		YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE		DRAWN BY: E COLLINS	DATE 08/03/92	PROJECT <b>B-595</b>	FLUOR CONTRACT NO. <b>8457</b>
								TRACING MEDIUM					X	DESIGN		0.500	150	PROCESS		OPERATING		0	AMBIENT	VAPOR	X	LIQUID	SCALE <b>NONE</b>	BUILDING NO. <b>1</b>	INDEX NO.	
								TRACER: QTY					X	REFERENCE PLAN DWG H-2-124095-1		REFERENCE P&ID H-2-123060-14/15		CLASSIFICATION <u>NONE</u> BY <u>NOT REQUIRED</u>				LINE NUMBER AND CLASS PE-1"-20C-151-A-NONE		SHEET 01	OF	DRAWING NUMBER H-2-126180		SHEET 1	OF	REV. 0
0	AFC	ELC	11-12-90				gll	ELECTRIC TRACE					X	SECTION A6/E3																
								HEAT TRANSFER CEMENT REQUIRED					X																	

[illegible]

DISTRIBUTION CODE: 504

PDS

MMF  
10/22/92

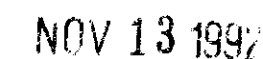
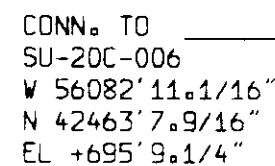
Oct 22 10:03:17 1992 CAIMA VELLUM E:XB3MF80A.SPL

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FABRICATION MATERIALS

PT NO --	PIPE -----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
1		PIPBAR PIPE SCH 40S 5MLS 304L SS A312	1	5364086	33.6'

BILL OF MATERIAL FOR REFERENCE ONLY







QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES3T

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-B6RL10B3B					
△								TOTAL ISO					X	B-595-C-B210A SECTION 15060				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		PROJECT TITLE <b>HANFORD WASTE VITRIFICATION PLANT</b>					
△							PARTIAL ISO																		
△								HEAT TRACING REQUIREMENTS				YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE		CADFILE	CADCODE	SCALE				
△								TRACING MEDIUM					X	DESIGN	0.500	150	PROCESS		B126181A	2B: APL:DDM3:7.0:SS	PROJECT				
△								TRACER: QTY _____ SIZE _____					X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	DRAWN BY: E COLLINS		DATE: 08/04/92	PROJECT	FLUOR CONTRACT NO.	CWBS NO.
△								ELECTRIC TRACE					X	REFERENCE PLAN DWG H-2-124094-1		REFERENCE P&ID H-2-123060-15/8		CLASSIFICATION NONE		BY NOT REQUIRED		SCALE	BUILDING NO.	INDEX NO.	
0	AFC	ELC	11/10/92	SDW	TEC			HEAT TRANSFER CEMENT REQUIRED					X	SECTION E3/A7		LINE NUMBER AND CLASS PE-1"-20C-141-A-NONE		SHEET 01	OF	DRAWING NUMBER H-2-126181			SHEET 1	OF	REV. 0

21DA						H-2-126181		O	I			AFC																																																																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

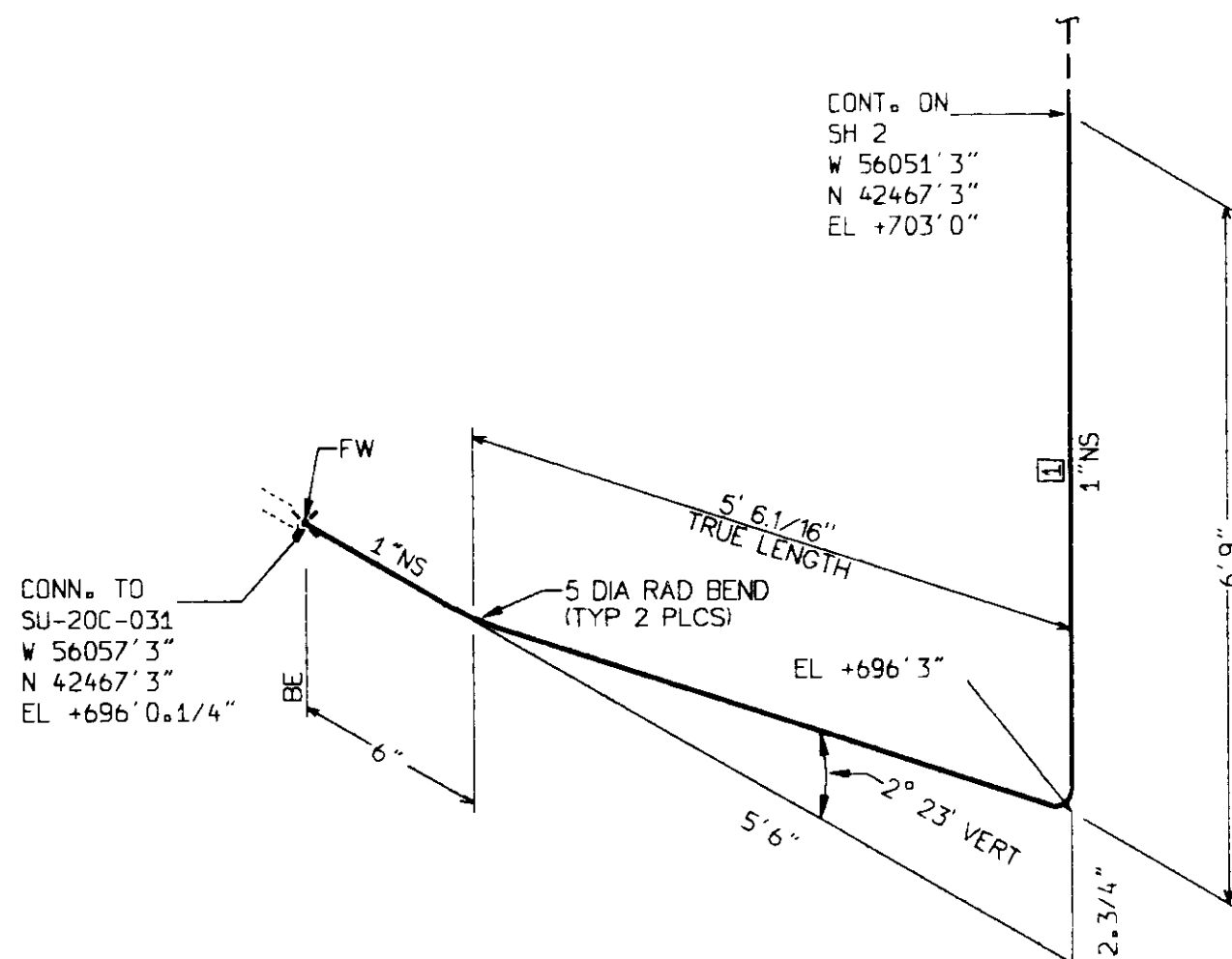
DISTRIBUTION CODE: 504

PDS MKF  
10/22/92

u Oct 22 10:10:10 1992 CALMA VELLUM E:XXB3MF81.SPL


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FABRICATION MATERIALS

PT NO --	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086	35.7'



QUALITY LEVEL II  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-B6RL1083B																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
△								TOTAL ISO					X	B-595-C-B210A SECTION 15060				CADFILE B126182A	CADCODE 2B:APL:DDM3:7.0:SS	PROJECT TITLE <b>HANFORD WASTE VITRIFICATION PLANT</b>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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△								HEAT TRACING REQUIREMENTS				YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE		DRAWN BY: E COLLINS	DATE 08/04/92	PROJECT <b>B-595</b>	FLUOR CONTRACT NO. <b>8457</b>	CWBS NO. <b>B210A</b>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
								TRACING MEDIUM					X	DESIGN	0.500	150	PROCESS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
△								TRACER: QTY				SIZE		X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	CLASSIFICATION NONE	BY NOT REQUIRED	SCALE <b>NONE</b>	BUILDING NO. <b>1</b>	INDEX NO.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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△								ELECTRIC TRACE					X	LINE NUMBER AND CLASS PE-1"-20C-142-A-NONE				SHEET 01	OF	DRAWING NUMBER H-2-126182																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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[illegible]

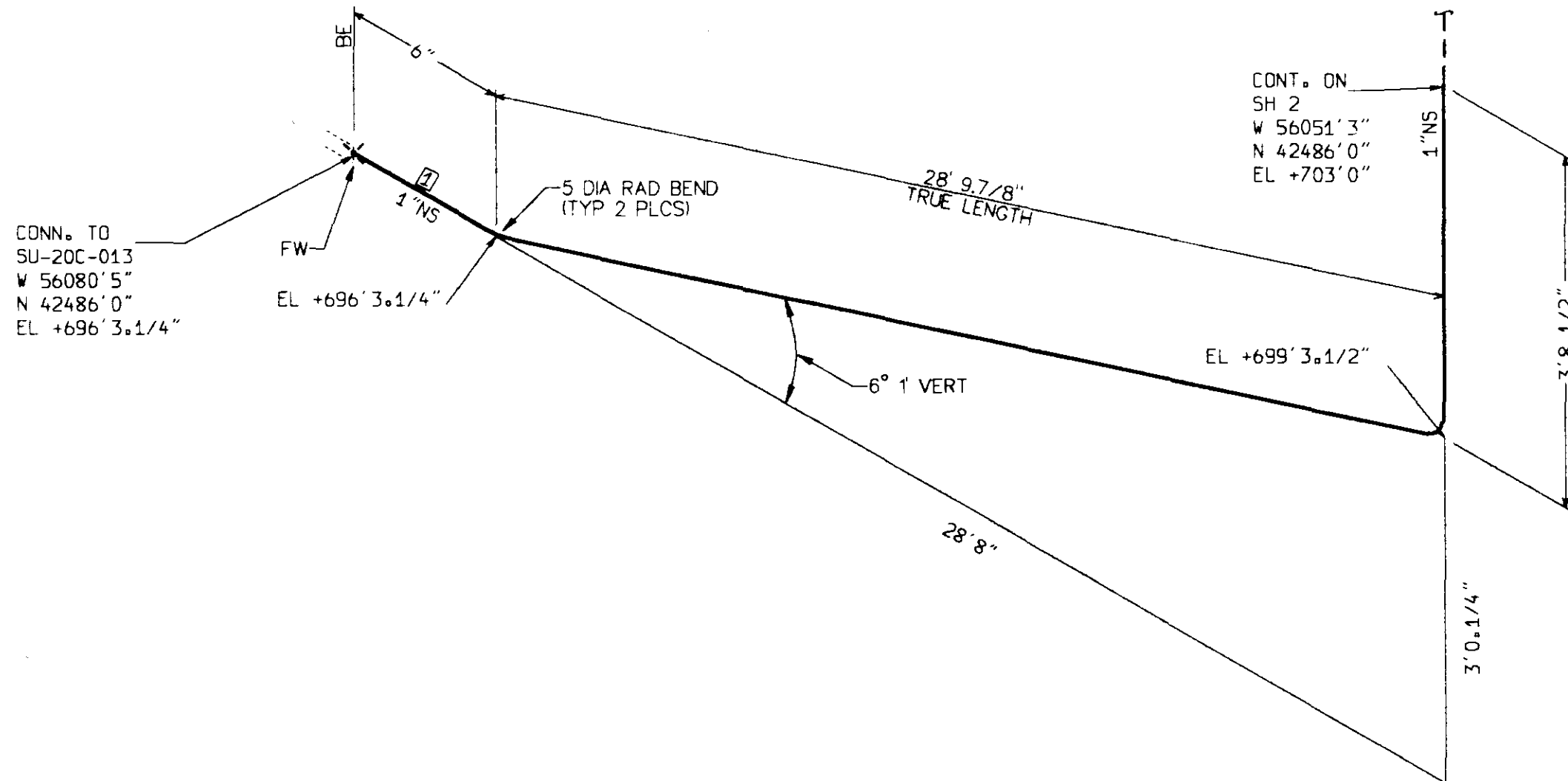
DISTRIBUTION CODE: 504

PDS MKF  
10/22/92

Oct 22 10:12:56 1992 CALMA VELLUM E:XXB3MF82.SPL

-----   FABRICATION MATERIALS   -----				
PT NO --	PIPE ----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE QTY -----
1		PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086 12.8'

BILL OF MATERIAL FOR REFERENCE ONLY



NOV 13 1992

QUALITY LEVEL II  
SAFETY CLASS 3

MODEL: PIPE/PAES3T

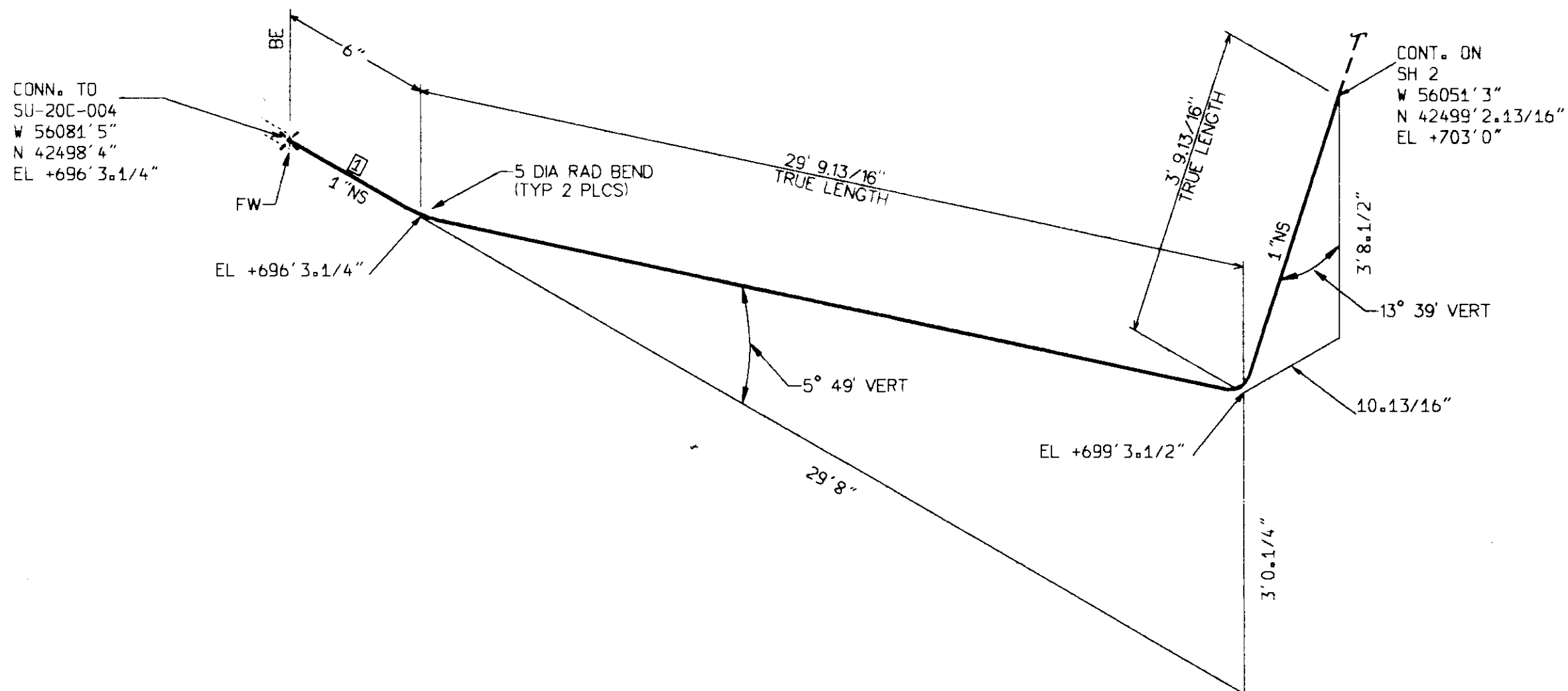
☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHKD	APPVD	MATL	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-B6RL10838				
								TOTAL ISO					X	B-595-C-B210A SECTION 15060				CADFILE B126183A		CADCODE 2B:APL:DDM3:7.0:SS		PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT		
								PARTIAL ISO										DRAWN BY: E COLLINS		DATE 08/04/92		PROJECT B-595		
								HEAT TRACING REQUIREMENTS					YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE			FLUOR CONTRACT NO. 8457		CWBS NO. B210A	
								TRACING MEDIUM					X	DESIGN	0.500	150	PROCESS			BUILDING NO. 1		INDEX NO.		
								TRACER: QTY SIZE					X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	SCALE NONE				
								ELECTRIC TRACE					X	REFERENCE PLAN DWG H-2-124094-1	REFERENCE P&ID H-2-123060-15/8		CLASSIFICATION NONE		BY NOT REQUIRED		DRAWING NUMBER H-2-126183		SHEET 1	
0	AFC	ELC	11-16-92					HEAT TRANSFER CEMENT REQUIRED					X	SECTION D3/A7	LINE NUMBER AND CLASS PE-1"-20C-143-A-NONE		SHEET 01		OF		REV. 0			

Oct 22 10:33:19 1992 CALMA VELLUM E:\XB3M\F83.SPL


-----   FABRICATION MATERIALS   -----				
PT NO --	PIPE ----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE    QTY -----    ---
1		PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086    33.1'

BILL OF MATERIAL FOR REFERENCE ONLY



QUALITY LEVEL II  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHKD	APPVD	MATL	STRESS	INSULATION					FABRICATION SPECIFICATION					 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL1083B											
								1H	IS	IC	IA	NONE																			
△													X	B-595-C-B210A SECTION 15060																	
△														HEAT TRACING REQUIREMENTS		YES	NO	CONDITION		PRESS (PSIG)	TEMP (°F)	SERVICE		CADFILE		CADCODE		PROJECT TITLE			
△														TRACING MEDIUM			X	DESIGN		0.500	150	PROCESS		B126184A		2B: APL:DDM3:7.0:SS		HANFORD WASTE VITRIFICATION PLANT			
△														TRACER: QTY		SIZE	X	OPERATING		0	AMBIENT	VAPOR	X	LIQUID	DRAWN BY: E COLLINS		DATE 08/04/92		PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. B210A
△														ELECTRIC TRACE			X	REFERENCE PLAN DWG H-2-214094-1		REFERENCE P&ID H-2-123060-15/8				CLASSIFICATION NONE		BY NOT REQUIRED		SCALE NONE	BUILDING NO. 1	INDEX NO.	
0	AFC	ELC	11-10-92	DCG			kgell							HEAT TRANSFER CEMENT REQUIRED			X	SECTION E3/A7				LINE NUMBER AND CLASS PE-1"-20C-144-A-NONE		SHEET 01	OF	DRAWING NUMBER H-2-126184			SHEET 1	OF	REV. 0

[illegible]

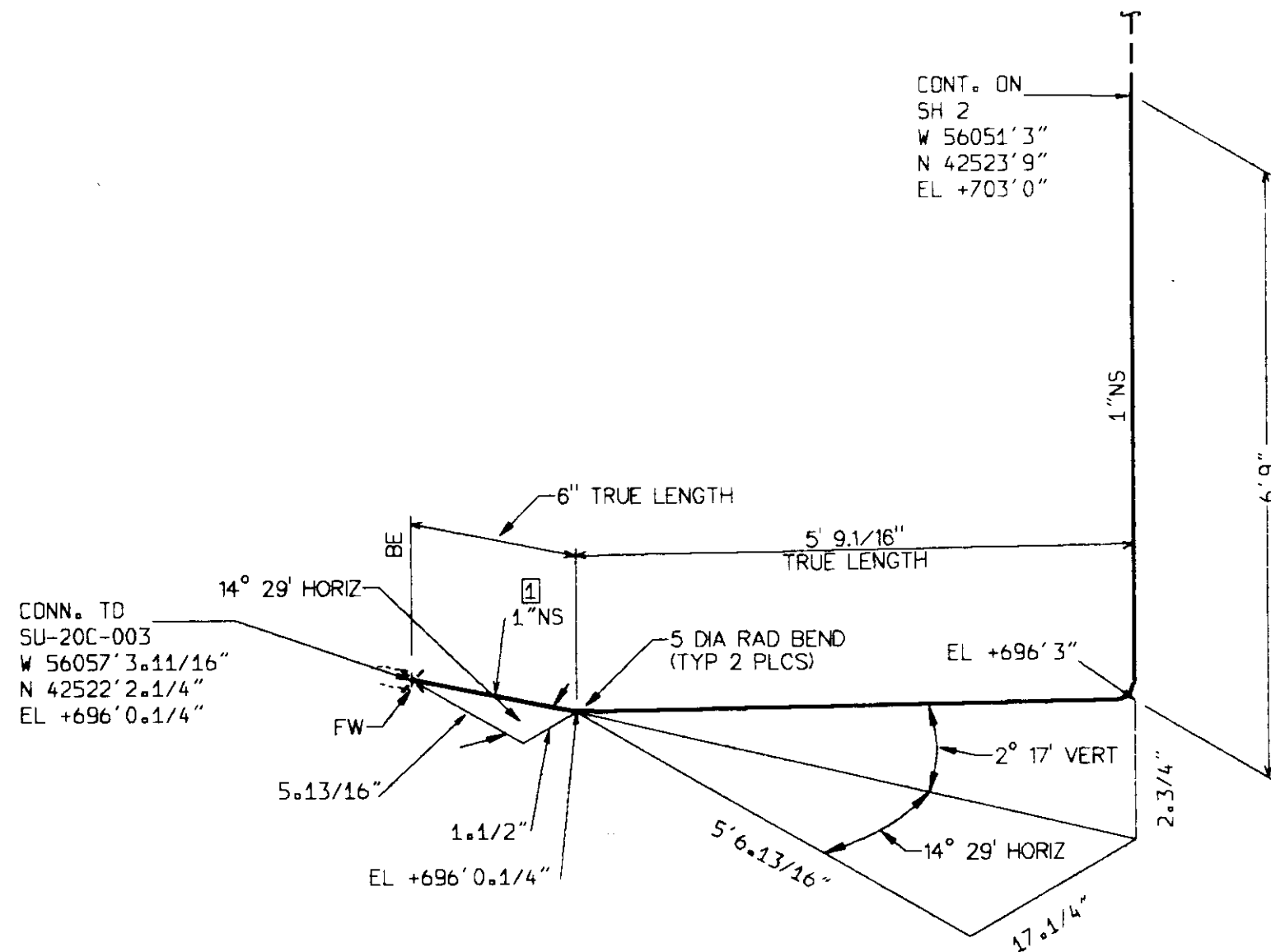
DISTRIBUTION CODE: 504 PDS MKF  
10/22/92

OCT 22 10:42:28 1992 CALMA VFTIIM FXXB3MFR4.SPI

-----  
FABRICATION MATERIALS


PT NO	PIPE	COMPONENT DESCRIPTION	N.S. (INS)	ITEM CODE	QTY
1		PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086	34.2'





QUALITY LEVEL II  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION	U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-B6RLI0938											
								TOTAL ISO					X	B-595-C-B210A SECTION 15060																
								PARTIAL ISO						HEAT TRACING REQUIREMENTS		YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE		CADFILE	CADCODE	PROJECT TITLE					
														TRACING MEDIUM			X	DESIGN	0.500	150	PROCESS		B126185A	2B: APL:DDM3:7.0:SS	HANFORD WASTE VITRIFICATION PLANT					
														TRACER: QTY			X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	DRAWN BY: DATE		PROJECT	FLUOR CONTRACT NO.	CWBS NO.		
														SIZE			X	REFERENCE PLAN DWG		REFERENCE P&ID		CLASSIFICATION		BY		SCALE	BUILDING NO.	INDEX NO.		
																	X	H-2-124094-1		H-2-123060-15/8		NONE		NOT REQUIRED		NONE	1			
														ELECTRIC TRACE			X			SECTION		LINE NUMBER AND CLASS		SHEET	OF	DRAWING NUMBER		SHEET	OF	REV.
0	AFC	ELC	11-1-90				Shell							HEAT TRANSFER CEMENT REQUIRED			X			F3/A7		PE-I-20C-149-A-NONE		01		H-2-126185		1		0

[illegible]

DISTRIBUTION CODE: 504 PDS MKF  
10/22/92

1 Oct 22 10:47:30 1992 CALMA VELLUM F:XXB3MF85.SPL

I FABRICATION MATERIALS I					
PT NO --	PIPE -----	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
1	PIPBAR	PIPE SCH 40S SMLS 304L SS A312	1	5364086	13.1'

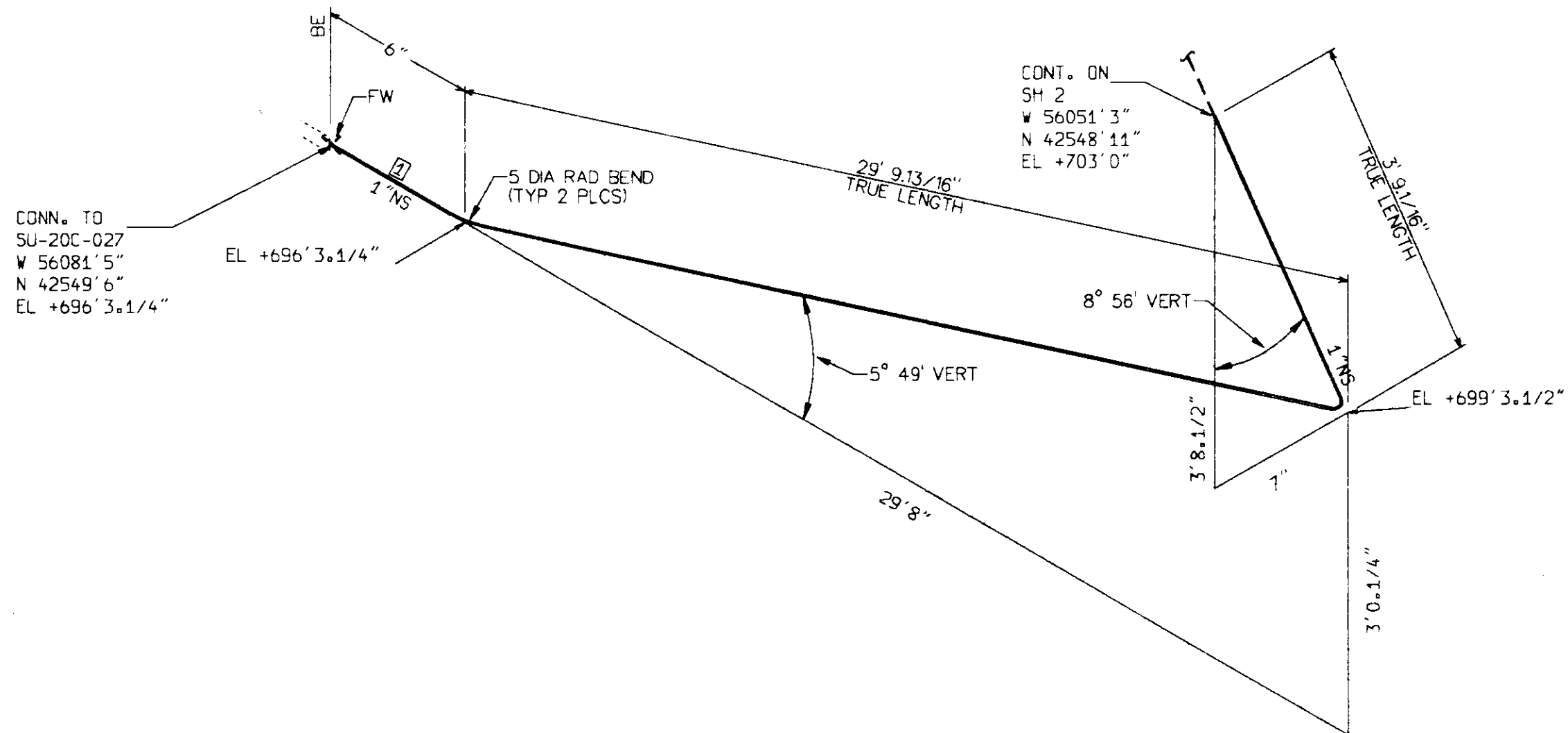
BILL OF MATERIAL FOR REFERENCE ONLY



## FABRICATION MATERIALS


PT NO ---	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
	CARRIER PIPE -----			
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	6	5364086	48.7'
2	PIPBAR PIPE SCH 40S SMLS 304L SS A312	3	5364086	6.4'
	CARRIER FITTINGS -----			
3	LATBW LATERAL, SCH40S, SMLS, SS-304L	6X3	5440851	2
4	ELLBW ELL 90 DEG LR SCH40S 304L SS A403 WP304L	6	5438922	1
5	ANCHOR 5EDA2 PER DWG H-2-124091 SH 1	6-10	5EDA2	1
6	PIPE SUPPORT 5ES1 PER DWG H-2-124091 SH 1	6-10	5ES1	1
7	PIPE GUIDE 5EG1 PER DWG H-2-124091 SH 1	6-10	5EG1	1
8	45LBW ELL 45 DEG SCH 40S 304L SS A403 WP304L	3	5438928	2
	CONTAINMENT PIPE -----			
9	PIPBAR PIPE SCH40S SMLS 304L SS A312	10	5364086	49.4'
10	PIPBAR PIPE SCH 40S SMLS 304L SS A312	6	5364086	1'
	CONTAINMENT FITTINGS -----			
11	LATBW SPLIT-LATERAL,SCH 40S,SS-304L	10X10	5440852	1
12	LATBW SPLIT-LATERAL,SCH 40S,SS-304L	10X6	5440852	1
13	ELLBW ELL 90 DEG LR SCH40S 304L SS A403 WP304L	10	5438922	1
14	45LBW ELL 45 DEG SCH 40S 304L SS A403	10	5438928	1
15	45LBW ELL 45 DEG SCH 40S 304L SS A403	6	5438928	1

BILL OF MATERIAL FOR REFERENCE ONLY



QUALITY LEVEL II  
SAFETY CLASS 3

☒ DENOTES PART NO.,  
SEE BILL OF MATERIAL

REV.	TYPE	BY	DATE	CHK'D	APP'VD	MAT'L	STRESS	INSULATION	IH	IS	IC	IA	NONE	FABRICATION SPECIFICATION				 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		U.S. DEPARTMENT OF ENERGY Richland Field Office DE-AC06-86RL1083B						
								TOTAL ISO					X	B-595-C-B210A SECTION 15060												
								PARTIAL ISO																		
								HEAT TRACING REQUIREMENTS				YES	NO	CONDITION	PRESS (PSIG)	TEMP (°F)	SERVICE	CADFILE	CADCODE	PROJECT TITLE						
								TRACING MEDIUM					X	DESIGN	0.500	150	PROCESS	B126186A	2B: APL:DDM3:7.0:SS	HANFORD WASTE VITRIFICATION PLANT						
								TRACER: QTY					X	OPERATING	0	AMBIENT	VAPOR	X	LIQUID	DRAWN BY: E COLLINS	DATE 08/04/92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. B210A		
								SIZE					X	REFERENCE PLAN DWG H-2-124094-1		REFERENCE P&ID H-2-123060-15/8		CLASSIFICATION <u>NONE</u>		BY <u>NOT REQUIRED</u>		SCALE NONE	BUILDING NO. 1	INDEX NO.		
								ELECTRIC TRACE					X			SECTION C3/A7		LINE NUMBER AND CLASS PE-1"-20C-146-A-NONE		SHEET 01	OF	DRAWING NUMBER H-2-126186		SHEET 1	OF	REV. 0
0	AFC	ELC	11-16-92				<i>plg</i>	HEAT TRANSFER CEMENT REQUIRED					X													

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DISTRIBUTION CODE: 504 PDS MKF  
10/22/92

Oct 22 14:52:38 1992 CAIMA VELLUM E:\XB3MF86.SPL

-----  
I FABRICATION MATERIALS I  
-----

PT NO --	PIPE	COMPONENT DESCRIPTION -----	N.S. (INS) ---	ITEM CODE -----	QTY ---
1		PIPBAR PIPE SCH 40S SMLS 304L SS A312	1	5364086	34.1'

BILL OF MATERIAL FOR REFERENCE ONLY




I FABRICATION MATERIALS I				
PT NO	COMPONENT DESCRIPTION	N.S. (INS)	ITEM CODE	QTY
CARRIER PIPE				
1	PIPBAR PIPE SCH 40S SMLS 304L SS A312	6	5364086	82.2'
2	PIPBAR PIPE SCH 40S SMLS 304L SS A312	3	5364086	9.7'
CARRIER FITTINGS				
3	LATBW LATERAL, SCH40S, SMLS, SS-304L	6X3	5440851	2
4	PIPE GUIDE SEG1 PER DWG H-2-124091 SH 1	6-10	SEG1	2
5	PIPE SUPPORT SES1 PER DWG H-2-124091 SH 1	6-10	SES1	2
6	45LBW ELL 45 DEG SCH 40S 304L SS A403 WP304L	3	5438928	2
CONTAINMENT PIPE				
7	PIPBAR PIPE SCH 40S SMLS 304L SS A312	10	5364086	86.6'
CONTAINMENT FITTINGS				
8	45LBW ELL 45 DEG SCH 40S 304L SS A403 WP304L	10	5438928	2
9	LATBW SPLIT-LATERAL, SCH40S,SMLS, SS-304L	10X10	5440852	2

BILL OF MATERIAL FOR REFERENCE ONLY



QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CADFILE	B120061A			CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office</p> <p>DE - AC06-86RLJ0838</p> <p>NOV 13 1992</p> <p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p> <p>MECH VIT BLDG EMBEDDED TUBE SMEAR TEST EXIT TUNNEL ASSEMBLY</p>					
REV _____ DATE _____							
ERO _____							
SIGNATURE _____ DATE _____							
PROJ DIR _____							
QA MGR _____							
INDEPENDENT SAFETY MGR _____							
PROJECT MGR _____							
SYSTEMS MGR _____							
ENGINEERING MGR _____							
SUPERVISOR <i>[Signature]</i> 11/11/92		PROJECT TITLE					
DESIGN ENGINEER <i>[Signature]</i> 11/11/92		HANFORD WASTE VITRIFICATION PLANT					
CHECKED <i>[Signature]</i> 11/11/92		PROJECT B-595		FLUOR CONTRACT NO. 8457		CWBS NO. B210A	
DRAWN C. PEASE 04-06-92		SCALE 1/8		BLDG NO. 1		INDEX NO.	
CLASSIFICATION		BY		DRAWING NUMBER		SHEET	
NONE		NOT REQD		H-2-120061		1	
						OF	
						1	
						REV	
						C	

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DISTRIBUTION CODE: 403


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INITIALS: SMT

DATE: 11-10-92

QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CAD FILE	B120073A			CAD CODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<b>U.S. DEPARTMENT OF ENERGY</b> Richland Field Office DE - AC06-86RL10838, 13 1992					
REV	DATE						
ERO							
SIGNATURE	DATE	 <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b>  <b>MECH VIT BLDG</b> <b>MC-ICC ELEC CONN</b> <b>INR CSTR CLOSURE</b> <b>ASSY</b>					
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR		<b>HANFORD WASTE VITRIFICATION PLANT</b>					
SUPERVISOR							
DESIGN ENGINEER							
CHECKED							
DRAWN		PROJECT TITLE		PROJECT		FLUOR CONTRACT NO.	
G. HOLT	06/09/92	H-2-120073		B-595		8457	
CLASSIFICATION	BY	DRAWING NUMBER		SCALE		BLDG NO.	
NONE	NOT REQD	H-2-120073		1/8		1	
		SHEET		OF		REV	
		1		4		C	

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DISTRIBUTION CODE: 403

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INITIALS: SMT  
DATE: 11-10-92

QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CADFILE	B120073B			CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office</p> <p>DE - AC06-86RL10838</p> <p>NOV 13 1992</p>					
REV _____ DATE _____							
ERO _____		<p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>					
SIGNATURE _____ DATE _____							
PROJ DIR _____		<p>MECH VIT BLDG</p> <p>MC-ICC ELEC CONN</p> <p>INR CSTR CLOSURE</p> <p>EMBED FR</p>					
QA MGR _____							
INDEPENDENT SAFETY MGR _____		<p>PROJECT TITLE</p> <p>HANFORD WASTE VITRIFICATION PLANT</p>					
PROJECT MGR _____							
SYSTEMS MGR _____		<p>PROJECT B-595</p> <p>FLUOR CONTRACT NO. 8457</p> <p>CWBS NO. B210A</p>					
ENGINEERING MGR _____							
SUPERVISOR _____		<p>SCALE 1/8</p> <p>BLDG NO. 1</p> <p>INDEX NO.</p>					
DESIGN/ENGINEER _____							
CHECKED _____		<p>DRAWING NUMBER</p> <p>H-2-120073</p>					
DRAWN G. HOLT							
CLASSIFICATION		BY		SHEET		OF	
NONE		NOT REQD		2		4	
				C			

DISTRIBUTION CODE: 403


M8

ACAD

INITIALS: SMT

DATE: 11-10-92

QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION		APPROVAL INITIALS			
CAD FILE	B120073C		CAD CODE	2B:IBM:ACD2:10.C2:SS			
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office DE - AC06-86RL10838 NOV 13 1992</p> <p> FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION</p> <p>MECH VIT BLDG - MC-ICC ELECT CONN INR CSTR CLOSURE SECT &amp; DET</p>					
REV _____	DATE _____						
ERO _____							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR		PROJECT TITLE		HANFORD WASTE VITRIFICATION PLANT.			
DESIGN ENGINEER		PROJECT	FLUOR CONTRACT NO.	CWBS NO.			
CHECKED		B-595	8457	B210A			
DRAWN		SCALE	BLDG NO.	INDEX NO.			
G. HOLT	06/16/92	SHOWN	1				
CLASSIFICATION	BY	DRAWING NUMBER		SHEET	OF	REV	
NONE	NOT REQD	H-2-120073		3	4	C	

2

DISTRIBUTION CODE: 403

M9


ACAD

1

INITIALS: SMT

DATE: 11-10-92

QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CADFILE	B120073D			CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p align="center"><b>U.S. DEPARTMENT OF ENERGY</b></p> <p align="center">Richland Field Office DE - AC06-86RL10838</p> <p align="center">NOV 13 1992</p> <p align="center"> <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b></p> <p align="center"><b>MECH VIT BLDG MC-ICC ELEC CONN INR CSTR CLOSURE ADJ FR</b></p>					
REV	DATE						
ERO							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR	11/11/92	<p align="center"><b>PROJECT TITLE</b> <b>HANFORD WASTE VITRIFICATION PLANT</b></p>					
DESIGN ENGINEER	11/11/92						
CHECKED	11/11/92						
DRAWN	08/17/92						
R. JONES		PROJECT	B-595	FLUOR CONTRACT NO.	8457	CWBS NO.	B210A
CLASSIFICATION	NONE	BY	NOT REQD	SCALE	1/8	BLDG NO.	1
				DRAWING NUMBER	H-2-120073		
				SHEET	4	OF	4
				REV	C		

DISTRIBUTION CODE: 403


M10

ACAD

INITIALS: SMT

DATE: 11-10-92

QUALITY LEVEL II  
SAFETY CLASS 3

C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION		APPROVAL INITIALS			
CAD FILE	B120141A		CAD CODE	2B:IBM:ACD2:10.C2:SS			
ENGINEERING RELEASE		<p align="center"><b>U.S. DEPARTMENT OF ENERGY</b></p> <p align="center">Richland Field Office DE - AC06-86RL10838</p> <p align="right">NOV 13 1992</p> <p align="center"> <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b></p> <p align="center"><b>MECH VIT BLDG EMBED TUBE CRN RTRV SYS SMEAR TEST EXIT TNL</b></p>					
REV _____ DATE _____							
ERO _____							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR		<p align="center"><b>PROJECT TITLE</b> <b>HANFORD WASTE VITRIFICATION PLANT</b></p>					
DESIGN ENGINEER							
CHECKED							
DRAWN							
C. PEASE	04/02/92	PROJECT	FLUOR CONTRACT NO.	CWBS NO.			
		B-595	8457	B210A			
		SCALE	BLDG NO.	INDEX NO.			
		1/4	1				
CLASSIFICATION	BY	DRAWING NUMBER		SHEET	OF	REV	
NONE	NOT REQD	H-2-120141		1	1	C	

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QUALITY LEVEL II  
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C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CAD FILE	B120241A			CAD CODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office DE - AC06-86RL10838</p> <p>NOV 13 1992</p> <p><b>FLUOR DANIEL, INC.</b> ADVANCED TECHNOLOGY DIVISION</p> <p><b>MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN ASSEMBLY</b></p>					
REV _____ DATE _____							
ERO _____							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR	<i>C. Brown</i>	11/11/92	PROJECT TITLE				
DESIGN ENGINEER	<i>L. J. Davis</i>	11/11/92	HANFORD WASTE VITRIFICATION PLANT				
CHECKED	<i>J. Hubbard</i>	11/11/92	PROJECT	FLUOR CONTRACT NO.	CWBS NO.		
			B-595	8457	B210A		
DRAWN	Ron Jones	09/17/92	SCALE	BLDG NO.	INDEX NO.		
			1/4	1			
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	RE		
NONE	NOT REQD	H-2-120241	1	5	C		

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C	11/10/92	ISSUED FOR BID PURPOSES ONLY.					
REV NO.	DATE	REVISION DESCRIPTION				APPROVAL INITIALS	
CADFILE	B120241B			CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p align="center">U.S. DEPARTMENT OF ENERGY</p> <p align="center">Richland Field Office DE - AC06-86RL10838</p> <p align="right">NOV 13 1992</p> <p> <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b></p> <p align="center"><b>MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN SECT &amp; DET</b></p>					
REV _____ DATE _____							
ERO _____							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR	11/11/92	<p align="center"><b>HANFORD WASTE VITRIFICATION PLANT</b></p>					
DESIGN ENGINEER	11/11/92						
CHECKED	11/11/92						
DRAWN	09/19/92						
Ron Jones		PROJECT	B-595	FLUOR CONTRACT NO.	8457	CWBS NO.	B210A
		SCALE	1/4	BLDG NO.	1	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER			SHEET	OF	REV
NONE	NOT REQD	H-2-120241			2	5	C

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REV NO.	DATE	REVISION DESCRIPTION		APPROVAL INITIALS			
CADFILE	B120241C		CADCODE	2B:IBM:ACD2:10.C2:SS			
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Field Office DE - AC06-86RL10838 NOV 13 1992					
REV _____ DATE _____ ERO _____							
SIGNATURE		DATE		 <b>FLUOR DANIEL, INC.</b> <b>ADVANCED TECHNOLOGY DIVISION</b>  <b>MECH VIT BLDG</b> <b>MC-CDC TRANS TUNNEL</b> <b>SUMP PRCS CONN</b> <b>EMBED FR</b>			
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR		11/11/92		PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
DESIGN ENGINEER		11/11/92					
CHECKED		11/11/92		PROJECT	FLUOR CONTRACT NO.	CWBS NO.	
DRAWN		09/17/92		B-595	8457	B210A	
Ron Jones				SCALE	BLDG NO.	INDEX NO.	
				1/4	1		
CLASSIFICATION	BY	DRAWING NUMBER		SHEET	OF	RI	
NONE	NOT REQD	H-2-120241		3	5	(	

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REV NO.	DATE	REVISION DESCRIPTION		APPROVAL INITIALS			
CADFILE	B120241D		CADCODE	2B:IBM:ACD2:10.C2:SS			
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office DE - AC06-86RL10838 NOV 13 1992</p> <p> FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION</p> <p>MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN SECT &amp; DET</p>					
REV _____ DATE _____							
ERO _____							
SIGNATURE	DATE						
PROJ DIR							
QA MGR							
INDEPENDENT SAFETY MGR							
PROJECT MGR							
SYSTEMS MGR							
ENGINEERING MGR							
SUPERVISOR		PROJECT TITLE					
DESIGN ENGINEER		HANFORD WASTE VITRIFICATION PLANT					
CHECKED		PROJECT	FLUOR CONTRACT NO.	CWBS NO.			
DRAWN		SCALE	BLDG NO.	INDEX NO.			
CLASSIFICATION	BY	DRAWING NUMBER		SHEET	OF	REV	
NONE	NOT REQD	H-2-120241		4	5	C	

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CADFILE	B120241E			CADCODE	2B:IBM:ACD2:10.C2:SS	
ENGINEERING RELEASE				<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Field Office DE - AC06-86RL10838</p> <p><b>FLUOR DANIEL, INC.</b> ADVANCED TECHNOLOGY DIVISION</p> <p><b>MECH VIT BLDG MC-CDC TRANS TUNNEL SUMP PRCS CONN ADJ FR</b></p>		
REV _____ DATE _____						
ERO _____						
SIGNATURE		DATE				
PROJ DIR						
QA MGR						
INDEPENDENT SAFETY MGR						
PROJECT MGR						
SYSTEMS MGR						
ENGINEERING MGR						
SUPERVISOR		11/11/92		<p>PROJECT TITLE</p> <p><b>HANFORD WASTE VITRIFICATION PLANT</b></p>		
DESIGN ENGINEER		11/11/92				
CHECKED		11/11/92				
DRAWN		09/16/92				
Ron Jones						
CLASSIFICATION		BY	DRAWING NUMBER		SHEET	OF
NONE		NOT REQD	H-2-120241		5	5

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DATE: 11-10-